Nature Magazine

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MARCH 1941

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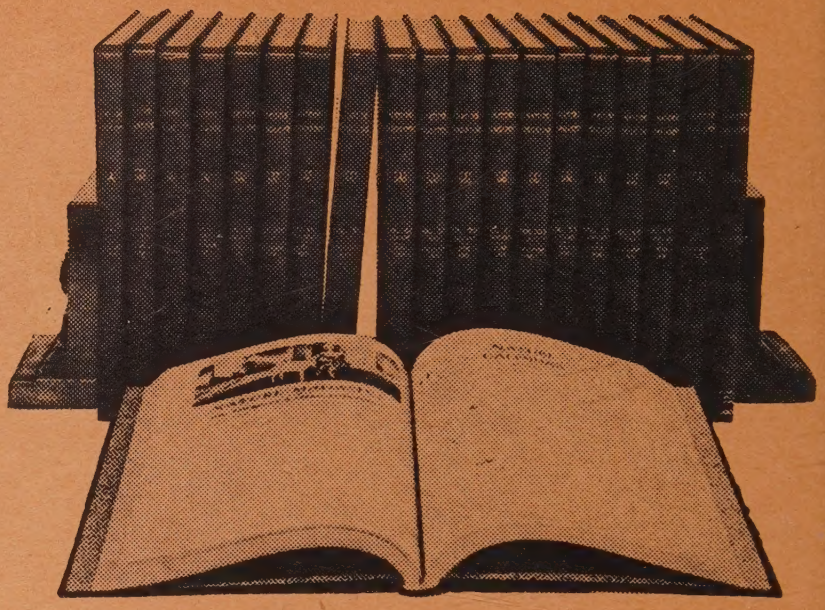

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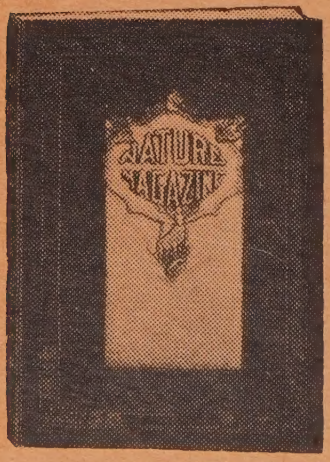

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ON THE RECORD

By "Disc"

Because the contest announced in this department in the January issue reached our readers right in the midst of the Christmas season, with the result that many did not catch up with their reading in time to enter, we feel that it is only fair to extend the closing date to March 15. Look back to page 48 of the January, 1941, magazine for the details. You will find it fun to explore your musical tastes and select the ten recordings you would like to take with you to a desert island for an extended visit. Then send your lists, with brief reasons for your selections, to "On the Record", Nature Magazine, 1214 16th Street, N. W., Washington, D. C.

Folk music is a part—and a vital one—of a people. Through the ages it has been handed down from generation to generation, preserving its original flavor and significance. It is another reason why dictators will never be able to snuff out nationalities and make people over into one pattern with the same thoughts and ideas and reactions. Americans have their folk music. It is not as old as that of other nations, but it is more varied, unique, and, often, more interesting. Much of it is indigenous, and an example of this type of folk music is found in Victor album P-41. On these records the American Ballad Singers have perpetuated a group of characteristic and exclusively American folk songs under the direction of Elie Siegmeister. The majority of us have never heard many of them before. They include "Poor Wayfaring Stranger", "Springfield Mountain", "Go to Sleepy", "Street Cries", "Grandma Grunts", "The Deaf Woman's Courtship", "Pat Works on the Railway", "Cotton Picking Song", and "Upon de Mountain".

On the air RCA-Victor conducted a contest to discover what listeners felt were the ten Victor records that should be in every home. The combinations were many, but from them it was discovered that the records receiving most universal acclaim were: "Tales from the Vienna Woods" and "The Blue Danube Waltz" by Strauss, played by Leopold Stokowski and the Philadelphia Orchestra (#15425); "Finlandia" by Sibelius, also played by Stokowski and the Philadelphia Orchestra (#7412); "Hungarian Rhapsody No. 2" by Liszt, played by the same combination (#14422); "Ave Maria; Aufenthalt" by Schubert, sung by Marian Anderson (#14210); "Tristan und Isolde—Isoldes Liebestod" by Wagner, sung by Kirsten Flagstad (#8859); "Pagliacci—Vesta La Giubba" by Leoncavallo, and "Marta—M'Appari" by Flotow, both sung by Caruso (#7720); "Ah! Sweet Mystery of Life" by Victor Herbert, and "Indian Love Call" by Friml, both sung by Jeanette MacDonald and Nelson Eddy (#4323); "Moonlight Sonata—Adagio Sostenuto" by Beethoven and "Minuet in G" by Paderewski, both played by Paderewski (#6690); "Andante Cantabile" by Tschaikowsky, and "Humoresque" by Dvořák, both played by Fritz Kreisler (#15217); "Rhapsody in Blue" by Gershwin, played by Paul Whiteman and his Orchestra (#35822). How near the norm are you?

We trust that by the time this appears in print ASCAP, BMI, NBC, CBS, MBS, YOU and ME will have gotten together. Of course YOU and ME have been rather on the side lines, but so far as the air waves have been concerned it has been interesting to hear some of the songs dug up from the bottom of the music barrel. We wonder whether this may not start a sort of vogue for older pieces in the home. If so, a welcome Victor album just recently brought out is P-45 on the records of which the Victor Salon Orchestra, aided and abetted by Anita Boyer, George Griffin and the Tune Twisters present hits from the Ziegfeld Follies of the past. It's nice to hear "Shine On, Harvest Moon", "Rose of Washington Square" and the others again. This is, indeed, a lovely album.

A quaint and attractive new Victor record is provided by a Swiss music box owned by Melville Clark of Syracuse, New York. This box is between seventy-five and one hundred years old, but plays "Silent Night, Holy Night," "The Wayside Chapel", "Moonlight on the Hudson" and "Monastery Bells" with all the verve of a much younger music box. Victor has preserved this entertaining and interesting accomplishment on record #26789.

•

Speed of the Hummingbird

Everyone can see that the hummingbird's wings move rapidly, so much so that they make a blur. But how fast does the bird go? Some credit these feathered mites with a steady cruising speed of 30 miles an hour and they have been observed to keep up with an automobile at 55-60 miles per hour. None of the estimates apparently, however, take into account the hummer's darting speed. Often these birds poise in the air as if suspended by an invisible thread. A bird is clearly seen at a definite point; suddenly it is no longer there, but looking about one sees it poising at another place. Sometimes the whole process from poise to poise is within eye scope, but the bird is not seen between the two points. That journey is accomplished by a dart so rapid that the eye cannot follow it. How fast is that? It is certainly more than 60 m.p.h. Won't some ingenious person please measure it for us?—W. L. M.

"George" is Dead

In Nature Magazine for March, 1934, we published one of the most appealing pictures ever taken—and one of the saddest. It was of a dead doe deer, killed because some hunter did not bother to look for horns. By her side was the orphaned fawn, wounded by the same shot that killed its mother. The fawn was taken and cared for at the Ogemaw State Game Refuge. He was named George. Lame and being handicapped in the woods, George was always enticed into the refuge enclosure when hunters' guns began to blaze in the fall. This past season the buck, seeking safety from the forest barrage, was wounded by a hunter. The refuge keeper found him lying wounded in a thicket but was unable to bring him to safety. Subsequent hunts failed to disclose his whereabouts and it is feared that George has gone, perhaps to yield his head and antlers to some trophy room. He was seven years old and known to thousands of visitors with affection.

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Camera Trails

BY NORRIS W. HARKNESS

Simple Equipment

A day or two ago I heard a man, whose name you would probably recognize, complain that his photographic equipment was too simple and entirely inadequate to Nature pictures. Then I showed him the pictures reproduced here and read him a letter from a thirteen-year-old naturalist whose whole equipment consists of a folding 616 Kodak and a supplementary lens for close-up work—his whole mechanical equipment, that is. More important is his ability to recognize a picture opportunity when he sees it, and his skill in using his simple apparatus. Here is the young man's letter.

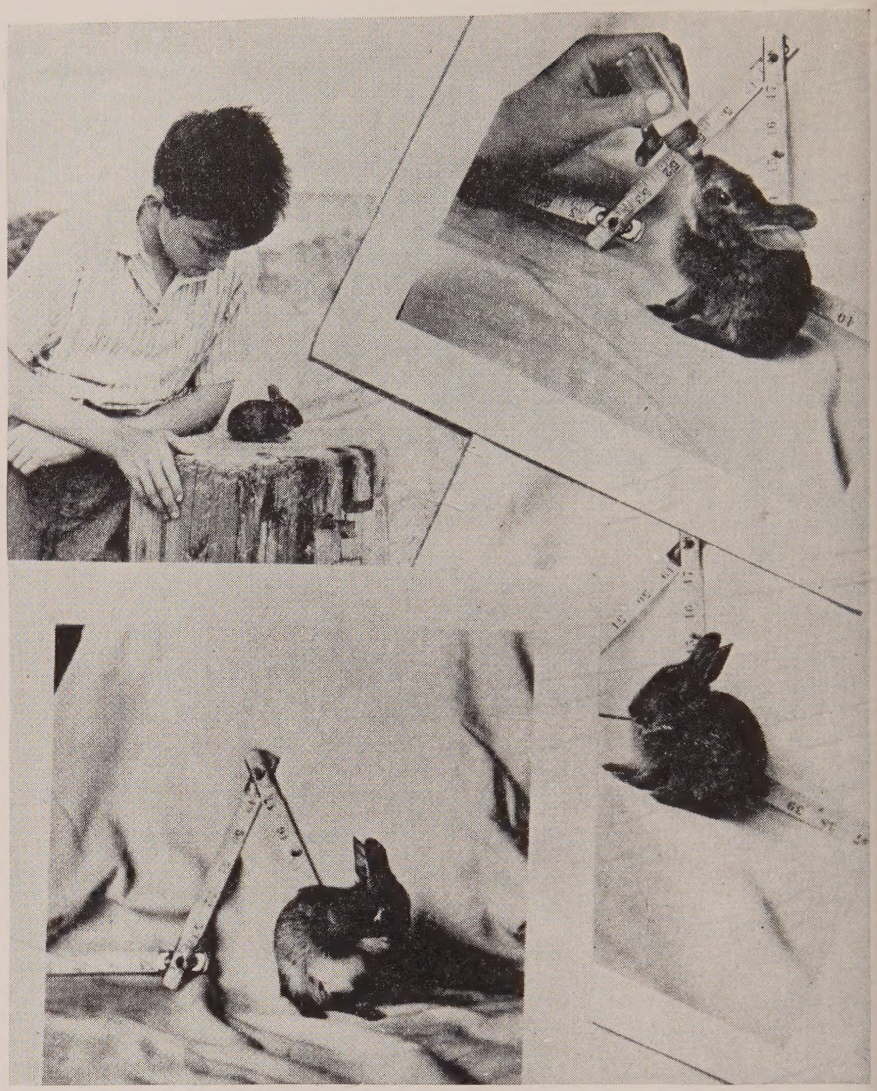
"On the Fourth of July at the shore I found a baby rabbit almost dead from exposure in a storm. It was so nearly gone that it couldn't move, even to move its nose or raise its ears. I dried it and carried it in my shirt to keep it warm.

"When I brought it home, we gave it warm milk in a doll's bottle, which it liked very much. He had milk twice a day for several weeks. It liked the tender ends of dune grass, clover and carrots.

" 'Rabbie' grew rapidly into a fine, strong rabbit. On August 11th I turned him loose near the spot where I found him. Every night we put a carrot out and he comes and eats it. We have seen him several times and he seems well and happy.

"Yours truly,
Harald Eriksson, age 13.
Haddonfield, New Jersey."

When the man whose name you would know had read the letter and looked over the pictures, somehow he had nothing more to say about his need of better cameras and more gadgets. How is your equipment?



ALL OF THE PICTURES IN THE COMPOSITE ABOVE WERE TAKEN BY HARALD ERIKSSON IN DAYLIGHT ON SUPER XX FILM WITH A KODAK 616 CAMERA. DETAILS WERE AS FOLLOWS: UPPER LEFT—1/50TH SECOND, F/11 AT SIX FEET OUTDOORS; UPPER RIGHT—1/50TH SECOND, F/7.7, PORTRAIT ATTACHMENT; LOWER LEFT—1/100TH SECOND, F/7.7, PORTRAIT ATTACHMENT; LOWER RIGHT—1/50TH SECOND, F/7.7, PORTRAIT ATTACHMENT

Developing a Negative

(Continued from last month)

Last month we began the discussion of the development of negatives. We spoke of using the developer recommended by the manufacturer of your film; of doing the work in the dark rather than exposing the sensitive material to the rays of a safe-light; of trying to standardize the developing method as far as possible with careful control of temperature, time and agitation—all simple things to do but requiring attention to each detail in the process.

Before we go into the actual development let us decide on the equipment that will be best. For roll films a tank is much to be preferred. When the film has been put into the reel of the tank in the dark, or with a changing bag, the whole process may be carried out in daylight without danger of injuring the film either by light or mechanically, and it need not be taken out until the washing is finished and we are ready to dry the negatives. For cut films or film packs the tank method is less satisfactory because the tanks on the market are harder to load and more likely to allow the films to get loose and touch each other. Some photographers who use the smaller sizes of the separate films, slide them into the ordinary roll film tank being sure they don't overlap and then treat them as they would the strip the tank was intended to hold. Others use the holders with clips in the corners and hang them in open tanks, but most often they are developed in trays, a method that runs considerable risk of damaging the delicate emulsion and of having the films stick together. For our negatives, then, it will be better if we get a tank and use it all the time. We will spoil fewer negatives and obtain more uniform results each time.

However, it is often necessary to do the developing in a tray, so let us see how we would go about it. First we need three trays; the first for the developer, the second for plain water, and the third for the hypo or fixing bath. It is important that we always place them in the same order for we will be working in the dark and it is easy to put the film in the hypo first and ruin everything. Make it so much a habit that you never need to think of which chemical is in the left or center tray. Of course, the room is perfectly dark and we know the temperature of the contents of each tray. They ought to be the same within a degree or two if we are to get the best results—a requirement that sometimes leads to complications in hot weather. If, for example, the maker's instructions call for seventy degrees for the developer while the room temperature is nearer ninety, it will not be enough to cool the first trayful to the 70 mark on your thermometer—each tray will have to be brought to the wanted heat and kept there throughout the development and fixing, and preferably through the washing, too. The easiest way is to put all three trays in a large pan with enough water at the right temperature around them to hold their contents where they belong. Adding more cold water or ice to the panful will keep everything cool enough.

Now, with the room dark and the three trays at the proper temperature and in their regular places, we remove the film from its paper backing. Do not touch the surface of the film any more than is necessary—handle it by the edges. Place the film in the middle tray—the one that contains the plain water—and roll it back and forth until its entire area is thoroughly wet and some of the stiffness of the celluloid is gone. Then either attach clips to each end of the film or hold them in your fingers and with the emulsion side—the inside of the curled film—down toward the bottom of the

tray; dip one end into the developer and pull the film through the solution by lowering one hand as the other goes up. This seesaw motion must be continued for the whole period of the development and care must be taken to keep the whole surface wet evenly all the time, but do not let the film get away from you and splatter you or your clothes—the developer will make indelible stains. The simplest way to time the operation is to have someone outside the darkroom call to you when the period is over. Then run the film through the tray of water to rinse off the developer and move it to the hypo tray where exactly the same motion must be continued for at least three minutes. After that time, the film may be allowed to curl up and lie in the hypo with only occasional movement every minute or two. When the fixing has gone on for five minutes, you can turn on the lights, but do not leave them on if there is any sign of milkiness in the emulsion. When it is all gone and the film is "cleared," as it is called, allow the film to remain in the hypo for another period as long as the clearing required. A total of about fifteen minutes is good. Then the film is ready to be washed.

The best washing method involves a long, shallow tray that will allow the film to lie flat while fresh water runs over it for fifteen minutes. If no such tray is available, or there is little water, run the film through a tray of fresh water for two minutes just as you did in the developer. Then allow the film to drain and repeat the process in another fresh trayful. When the film has been in six different fresh waters for two minutes each, it will be ready to dry. Using a squeezed-out viscose sponge or chamois folded into a flat pad, wipe off the free water from both surfaces and hang the film in a dust-free place in a current of air. Do not hang it in a hot place—room temperature is best.

Individual films, such as film packs and cut films, are handled in trays by placing each one separately in water until it is thoroughly wet—to avoid their sticking together later—and then putting the first, third, fifth, etc., in the tray of developer at right angles to those between them. With this criss-cross arrangement a tilt of the tray results in movement of each film over its neighbor and fresh developer on each part of all of them. The rinse and wash will be repetitions of the same handling in each tray, but the films should be transferred from one to another singly with time for each to drain before it goes into the next solution. Be careful not to let the corner of one film scratch the emulsion of another as you move them.

Next month we will discuss drying and tank development.

This and That

Eastman Kodak's new *Reference Handbook* is the most complete and helpful book on one company's materials and the methods for their use that has yet been presented to the amateur. Sections of the loose-leaf book are devoted to each part of the photographic process, and each one begins with a general but detailed discussion of that particular subject. The exact data are for the Eastman products, but the user of any photographic material needs this book. The price is $2.75.

Eastman's Senior Synchronizer (Model E) deserves inspection by any Nature photographer who plans high-speed work with flash bulbs. Strongly and neatly made, it works well up to 1/400th second and has an electrical release. One outstanding feature is the two-socket reflector that will accommodate either the golf-ball size bulb, or the regular larger ones, without any adapters or changes.

I have been using the new Speed-Ez-El, an all-metal easel with fixed margins that is available in various sizes up to 8" x 10". It is fast and convenient and leaves narrow margins all round. Raygram Corporation of 425 Fourth Avenue, New York, is the distributor. Write for their catalog and mention Camera Trails.

The new Leitz Desk Viewer for 2" x 2" Kodachrome, or black and white slides, or 35mm negative strips, has a rheostat to compensate for different densities in the transparencies and a focusing lens that is color corrected. For complete details write to the E. Leitz Company, 730 Fifth Avenue, New York.

You can obtain a sample of the fabric of the Britelite Wide Angle Crystal Screen by writing to Motion Picture Screen and Accessories Co., 351 West 52nd Street, New York, and mentioning this department.

The new Castle Film, "Super Thrills in the News", is another film that you need in your permanent library. It shows the break-up of the Tacoma, Washington, Bridge and the shelling of the French fleet at Oran at unbelievably close range and full detail. Their catalog will be mailed on request to Castle Films, 30 Rockefeller Plaza, New York.

The Weimet Company of 112 West 44th Street, New York, makers of Gem Kolor Chrome and other Gem products, have announced a colored print contest. For complete details of the contest write to the above.

Camera Trails is given space in NATURE MAGAZINE for the benefit of its photographer-readers and a service for their help with photographic questions is maintained. Your questions and suggestions as to the material in the department are welcome. Send them to Norris W. Harkness, 1214 Sixteenth Street, N. W., Washington, D. C.

●

Long Island Birds

Birds of Long Island is a valuable pamphlet compiled by Marie V. Beals and J. T. Nichols from data from a bird-banding station at Elmhurst, Long Island. The publication also contains notes on the Birds of Oyster Bay by C. K. McKeever. This is the third of a series of publications issued by the Bird Club of Long Island, Roslyn, New York, at one dollar a copy. The first two dealt respectively with life history notes on the Piping Plover and the Birds of Oyster Bay.

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Sixth Audubon Camp

When the first session opens on June 13 on a spruce-covered island in Muscongus Bay, Maine, the sixth season of the Audubon Nature Camp for Adult Leaders will be officially launched. During the past five summers 985 persons from thirty-seven states and four Canadian provinces have attended this camp. It has richly fulfilled its objective of providing teachers and youth leaders with practical programs for Nature study, and has offered opportunity to observe living plants and animals in their natural environment. There will be five sessions during 1941, each of two weeks and extending through August 28. The camp is operated at cost, and full details may be obtained by writing to the Camp Department, National Audubon Society, 1006 Fifth Avenue, New York City.

Nature School Has Home

Word comes from William Gould (Cap'n Bill) Vinal at Massachusetts State College that the Nature Guide School has a new and permanent home in the Berkshires. This comes about through the good offices of Raymond Kenney, Massachusetts Conservation Commissioner, who has arranged for the use of the Swann Forest headquarters and a former hunting lodge. This forest is a 1000-acre wildlife refuge stocked with deer, grouse, wild turkey and other forms and is situated in the heart of the 8000-acre Beartown State Forest. This is a strategic location for outdoor Nature courses, and this twenty-year-old institution will take on new life during the 1941 season.

Tenth Annual Pilgrimage

The Tenth Annual Pilgrimage of the Natchez, Mississippi, Garden Club will be held this year from March 22 through April 6. Attracting garden lovers and those who revel in the charm of the Old South, this annual event is also of interest to Nature enthusiasts because this region is rich in natural interest, not to mention its association with Audubon.

Nature Recreation Course

Camp directors seeking Nature leaders for summer camp work will find a useful source in the Office of the Naturalist, Dartmouth College, Hanover, New Hampshire, under the direction of which young men are being trained in Nature recreation work. This course, which is an elective and non-credit item in the curriculum, is designed to indicate to Nature leaders how to study natural history and to show how it can be introduced into school, home and camp programs. Field excursions supplement lecture sessions. The work is under the direction of Richard Weaver.

Doerr, Chief Naturalist

John E. Doerr, Jr., has been appointed Chief of the Naturalist Division of the National Parks Service, filling the vacancy left by the resignation of Earl A. Trager. Mr. Doerr has been with the National Park Service since 1931, serving at Hawaii National Park and in the naturalist work in the United States.

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Nature in Print

By HOWARD ZAHNISER

THERE is an old Gaelic saying, recalled by Edward A. Armstrong in his excellent collection of essays *Birds of the Grey Wind,* to the effect that "the venom of the cold trembles for its safety on Saint Bride's Day and flees for its life on Saint Patrick's Day." "Whatever the calendar or the Clerk of the Weather may say," Mr. Armstrong testifies, "I shall always regard the 17th of March as the beginning of spring."

The beginning of spring, whether fixed in recollection by a March holiday to be spent in the open like Mr. Armstrong's Saint Patrick's Day, or perhaps even earlier by remembrances of our own February excursions on Washington's Birthday, is always a time of reawakened interest in things of the outdoors. Such writings as Mr. Armstrong's accounts of his fascinating observations of oystercatchers, mergansers, short-eared owls, swans, herons, guillemots, and other birds; his descriptions of the loughs and hills, rocky coasts and islands of northern Ireland; and his reminiscences of a boyhood among birds become not only charming but also stirring with anticipations of spring.

It seems very appropriate that this season, when general interest in the outdoors runs high, should also be the time when our deep concern for the future of our outdoors should be given most careful consideration and full expression. Spring is, in other words, an excellent time for our wildlife conferences, and for practical thinking about our conservation problems. In fact, it is apparent that unless practical thought is given to such problems, the springs that will come in future years will mean less and less to us. In this field taking thought for the morrow is our only sure way of making it possible for the morrow to take care of itself. If we do this effectively we shall all have to take part, for as long as we maintain democracy we are all properly administrators of our public affairs, not the least of which is the conservation of our resources. We each have a public, practical duty to perform before we are entitled to the full enjoyment of the benefits of our way of living.

Fortunately, our thinking in connection with the conservation of our natural resources has made remarkable progress in recent years along the practical lines of public policy and administration. The complexities of the problems have been explored and have been seen in a perspective that makes it possible to present them clearly and cogently for general understanding. Not only have investigations and scientific inquiries been carried on intensively and extensively, not only have public discussion and controversy been fervent and stimulating, but also public agencies have been executing active programs, putting into practice in hundreds of large and diversified projects the conservation methods evolved through the studies and discussions. Our public experience in the practice of conservation is thus much richer and more varied than only a few years ago, and it is right that every citizen should have the benefit of this public experience for his own private understanding.

The readers of Dr. Ira N. Gabrielson's *Wildlife Conservation* in my opinion will certainly have this benefit, for it seems to me that this book rises directly out of the author's experience as the nation's principal wildlife administrator, seeking and making practical applications of the principles and methods of conservation. Written by one who by necessity is experienced especially in attending to interrelationships and in discovering the common grounds of conflicting interests, the volume is appropriately one that discusses mainly the basic facts and principles of wildlife conservation and the interrelationships of many diverse factors. It is not an exhaustive and detailed presentation of the many specific problems that face wildlife conservationists. Those who go to the book for such discussions may at first be disappointed, but I am confident that, no matter what problem they are concerned with, they will value highly the light thrown on it by this clear-cut statement of fundamentals and illuminating discussion of interrelationships. To those who are not acquainted with the complicated factors that make up our national and local wildlife problems, the volume will be a most fortunate introduction. All who read it will, I am sure, have a clear understanding of this field of conservation, an understanding aided greatly by Dr. Gabrielson's simple and direct though thoughtful style. *Wildlife Conservation* seems to me to be that rare thing—a book of interest and value both to expert and layman.

Wildlife enthusiasts on their first examination of Dr. Gabrielson's book will, I suspect, be rather surprised to find how much of the volume is devoted to discussions of what at first thought may appear to be other subjects—soil erosion, water conservation, forest conservation, and grassland conservation, to mention a few of the general topics that occupy nearly the first half of the work. If at the same time they should examine a copy of Professors Ely and Wehrwein's *Land Economics* I rather imagine that again they would be surprised at the discussions they would find there of the needs of wildlife conservation and of conservation in general, and I am sure they would note with interest the suggested definition of land economics as the economics of the utilization of natural resources. The point of view of the authors is illustrated by their neat statement that "Too (Continued on page 172)

Books discussed in this article are as follows:

Birds of the Grey Wind. By Edward A. Armstrong. London, New York, Toronto: Oxford University Press. 1940. 228 pp., with 11 sketches by the author, 46 photographs, map on end papers, and index. $3.50.

Land Economics. By Richard T. Ely and George S. Wehrwein. New York: The Macmillan Company. 1940. 512 pp., with 21 diagrams, 5 plates, including painting by John Steuart Curry and 4 portraits, bibliography, and index. $4.

Wildlife Conservation. By Ira N. Gabrielson. New York: The Macmillan Company. 1941. 250 pp., with 24 text figures including maps, 77 photographs, and index. $3.50.

ANT NEST, OR FORMICARY, IN SECOND GROWTH ON A COFFEE PLANTATION

Note the piles of leaf fragments here and there on the surface of the mound. One explanation of these is that they were carried to the nest during a rain and left outside, to be taken in when they have dried. Below is one of the large entrances to one of the galleries in the nest. A line of ants bearing leaf fragments is descending on the right and making a sharp turn toward the opening. One leaf-bearer is just going down hill into the opening and there are two directly behind this worker

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The Parasol Ant-America's First Farmer

By CARL L. WILSON

THE coffee planters of eastern Guatemala may be divided into two schools of thought—the "smoke 'em out" school and the "dig 'em out" school. Discussions of which is the better of these methods sometimes become quite heated, for they are arguing about how best to eradicate the parasol or leaf-cutting ant, a great pest in the coffee plantations. Indeed, they are a problem wherever agricultural operations are carried on throughout the American tropics.

Wherever one goes, whether in the streets of villages, on country roads, in cultivated lands, or in the thickets of second growth, one sees the well-marked paths of the parasol ant. These ants travel along paths from two or three inches, up to eight or ten inches, wide. Their numbers are countless, those headed toward the nest bearing a small piece of a green leaf held firmly in their jaws in such a manner that it extends vertically upward and backward over their bodies. On the same path another column of ants heads in the opposite direction, the individuals of this column having deposited their burden to hurry back for a fresh load.

The ends of these trails reveal an interesting story. At one end will be the tree or shrub upon which the ants are working. There they are traveling in irregular lines up and down the trunk, those headed downward bearing a leaf fragment. With their sharp jaws they have cut an irregular piece from a leaf. Several ants may work on the same leaf, and a whole army frequently attacks the same tree until it is stripped and stands with bare limbs and twigs amongst its fellows. A small tree may be stripped in a single night, and the depredations of the ants in a given neighborhood may be serious. So the coffee planter regards the parasol ant as an undesirable neighbor, because, given a choice, it places the coffee leaf high on its list of favored plants. Coffee, in fact, is second only to the leaves of citrus plants, such as oranges and limes. Unfortunate, also, is the third choice, the leaves of the banana, for these are important to the planter as a shade plant for his coffee.

THE "ANT EXPERTS"
Jacinto Cuz and Andres Coc are Kekchi Indians and laborers on the plantation. They have been digging ants out for sixteen years and know their business

At the other end of the trail is found a great mound of earth—the formicary. These mounds may attain diameters of ten, twelve, fifteen or more feet, and are penetrated by galleries meeting at several entrances. These openings are usually large, up to eight inches high, or more. Into these openings the moving column of ants carry the trophies of their raid upon their leafy prey.

Early travelers were quite at a loss to explain the use to which the ants put the

THE VARIOUS CASTES FOUND IN THE PARASOL ANT COMMUNITY

Reading from right to left, we find the queen, the soldier and the leaf-bearer, and the smaller castes. These last include the builders of the fungus nest, the weeders and the harvest hands. (All somewhat enlarged)

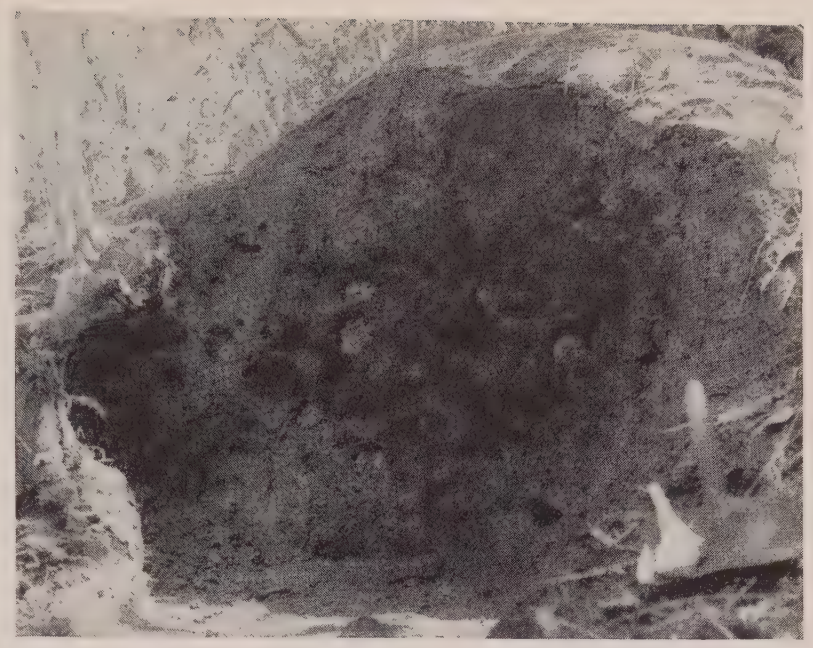
leaf fragments so tirelessly collected. Explanations advanced were varied. It was natural, perhaps, to assume that the ants were vegetarians, and that the leaves were used as food. One early observer thought the leaves were allowed to ferment, the heat thus produced contributing to the hatching of the eggs. Bates, in his *Naturalist on the Amazon,* declared, in 1863, that the ants thatched the domes of their subterranean dwellings with the leaf fragments. It remained for another English traveler, Belt, to solve the problem. Belt wrote, in 1874, in *A Naturalist in Nicaragua:* "Notwithstanding that these ants are so common in tropical America and have excited the attention of nearly every traveler, there still remains much doubt as to the uses to which the leaves are put. I believe that the real use they make of them is as manure, on which grows a minute species of fungus, on which they feed; that they are, in reality, mushroom growers and eaters." This remarkable conclusion was later confirmed by other students of the parasol ants.

THE WORK OF THE PARASOL ANT

At the left is the whole leaf of the mango tree, and the remains of the other two leaves give ample evidence of the efficient cutting equipment of the ants

Fortunately for my own observations, the manager of the coffee plantation where I spent many happy days high in the mountains of Guatemala belonged to the "dig 'em out" school. As I passed through the plantation on my way to the virgin forests far above I frequently came upon native workmen excavating a large nest. Beginning on the downhill side of the great mound, the formicary is dug away and the earth thrown back to form a platform in front of the mound. As the mound is opened and the first galleries exposed, the ants rush out and spread in all directions, viciously biting at every living thing. The workers seen carrying leaf fragments constitute only one class, or caste, of ants in the establishment. There are several others, readily distinguishable by differences in size. I became immediately aware of the largest of these castes when hot needles seemed to be driven here and there into parts of my body. The soldier ants, with tremendous heads and great biting jaws, and much larger than the leaf-bearers, have such powerful jaws that they readily draw blood from any exposed part of the body. The Indian workmen, customarily bare-footed and bare-legged, protect themselves, in part at least, by wrapping their feet and legs in old coffee bags, or in layers of banana leaves.

As the excavation proceeds toward the center of the mound the mattocks of the laborers expose large cavities, varying in size from six or eight inches in diameter to twelve inches across and eighteen inches high. These cavities are partly or entirely filled by a strange honeycomb-like structure, friable and pulverized by a touch. These



A FORMICARY CUT OPEN

The sponge-like masses are thus revealed. They are composed of macerated fragments of the leaf pieces brought into the nest by the workers for a garden plot

sponge-like masses are the center of the activities in the nest. Here the queens lay eggs throughout their lives and thus maintain the teeming thousands in the great society of workers and soldiers. The Indians, keen observers of their environment, say that from five to seven queens may be found in a large nest. Here, also, are other types of workers, similar in shape and color to the leaf-bearers, but smaller in size. Also from these nests the soldiers swarm in even greater numbers than from the galleries, intent upon fulfilling their sole function—defense. In the recesses of the spongy mass the larvae and pupae of the various castes of the parasol ant are tucked away.

An appropriate name for these masses of porous tissue is fungus nest, for that is what the material is—a food material upon which grows a tiny fungus that constitutes the sole food of the parasol ant, adults and larvae alike. The source of this food material is, of course, the leaf pieces carried into the dwelling. Indeed, so intent upon their work is the bearer caste, that even while the fungus nest is being destroyed by the workmen, a steady stream of leaf-bearers continue to pour into the cavity from the connecting galleries.

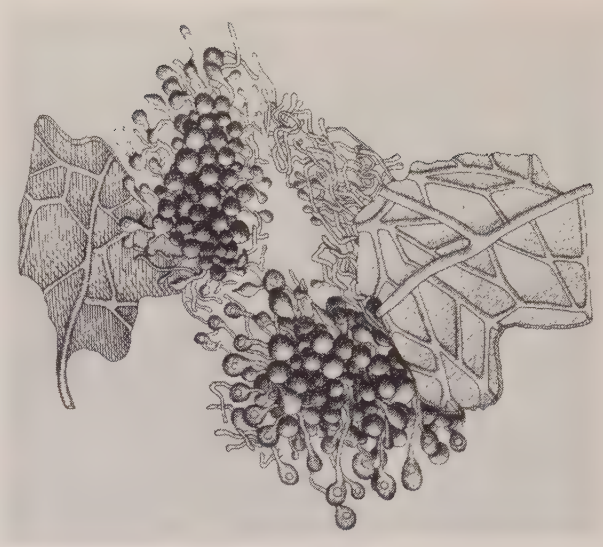
A microscopic examination of a bit of the spongy tissue reveals the nature of the fungus. Tiny threads, running through the mass of dissected leaf tissue, end in swollen knob-like structures. The production and utilization of this fungus is brought about directly by the activities of the smaller castes of workers. As a leaf-bearer arrives, individuals of the next smaller caste seize the leaf fragments and macerate them, turning them around and around in their jaws, and finally building the tiny fragments into the main mass of the nest. The fresh food materials thus supplied to the fungus are quickly utilized, as the threads spread in all directions. The members of the still smaller castes likewise have important functions. To some—the harvest hands—is delegated the duty of cutting off the swollen tips of the fungus and feeding the hungry larvae. To others is given the equally important task of weeding the fungus farm, for, like any other farmer, the ant is particular that his food crop shall not be overwhelmed by noisome weeds in the form of other kinds of fungi. This weeding is one of the most interesting of all the activities of the parasol ant, for with the constant movement of the leaf-bearers into the nest, spores, or reproductive bodies, of foreign species must continually be brought in, there to find favorable conditions for growth.

This relationship between the fungus and the ants is

FUNGUS NEST CLOSE-UP

Here it is seen in the cavity built for it in the nest. This peculiar structure is friable and will break apart when handled

one of the most specialized relationships in the world of living things. Without the food material furnished the fungus, the plant could not flourish; but, in turn, the ant takes tribute for its labors. This condition, in which two or more organisms live together for their mutual benefit, is known as symbiosis. And since the ants do actually cultivate a food plant, and since their specialized social life was certainly developed long before the appearance of man, we may call them the first farmers of the Western World.



DRAWING OF THE FUNGUS
These are the minute food plants cultivated in the nest, upon the swollen tips of which the larval and adult parasol ants subsist

How did the ants obtain their food plant originally, and how is it transferred to a new dwelling place? The first of these questions may never be answered; the answer to the second was found a number of years ago. At the time of swarming, an act characteristic of many of the social insects, the queens and fertile males leave the old home in great numbers. In eastern Guatemala this takes place in the rainy season, about the latter part of June. At this time the queens, as well as the males, are winged, and meet and mate in the air. After a quick divorce the queen falls to the ground, breaks off her wings, and excavates a small chamber beneath the surface of the soil. Here she begins an egg-laying process that continues throughout her life. At about this time she disgorges a small mass of the fungus that she has carried from the old formicary in a little pocket just under her gullet. No leaf substance is available as food for the tiny clump of fungus, but the fungus does not suffer—the queen manures it with her own feces. She does not eat the fungus at this stage, but, cannibal-like, eats some of her own eggs. As workers develop they bring in leaf fragments, feed the fungus, dig galleries and build the great fungus nests.

The workmen assigned to the task of excavating the nest and destroying its inmates are generally chosen for their intelligence and responsibility. Once chosen they are frequently kept at the same work for months and even years. The work is not easy, and the constant attacks of the soldier ants must finally upset the equilibrium of the most phlegmatic Indian. The prize for fortitude must be awarded, however, to Jacinto Cuz and Andres Coc—ant experts. They are really authorities upon the life and ways of the parasol ant, as indeed they should be, for they have been excavating ant mounds for sixteen years. Even their iron nerves failed at last, however, and they told the manager that they thought they were being poisoned by the ants and asked for some easier work, such as weeding coffee on steep slopes in the hot sun.

Because I expressed a desire to observe the excavation of an ant mound from start to finish, my genial and courteous host, R. W. O'Donnell, placed my "ant experts" at the job of excavating a huge mound, known to be four years old. This task took four days, during which I first learned of the various kinds of guests, tolerated if not welcomed, in the galleries and nests. Shortly after excavation started a frog emerged from one of the several entrances and hopped quickly away. Later, a spider, about two inches long and with attached egg sac, ran out of a gallery. The soldiers immediately attacked the spider with great ferocity, pulled it down and killed it, although it had been a guest in the mound.

Next the excavators uncovered several huge beetles, nearly two and one-half inches long, together with several pupae of the same species. These beetles are related to the scarabs. The larvae of this group commonly feed upon wood or woody materials, and may have fed upon the refuse from the fungus nests.

While this mound was being destroyed word came that cooked corn was being stolen from an Indian rancho, or hut, situated about fifty yards from the mound. The food had disappeared at night, and the ants were undoubtedly the thieves. Such thefts have been reported by other observers of the ways of the ants, although no one has ever explained the use to which the ants put the stolen food. One can only assume that such foods, like the leaf material, is added to the fungus nests to serve as additional nourishment for the fungus. At any rate, Jacinto Cuz, caught in a conversational mood, halted his work of destruction long enough to relate to us a legend of his tribe, the Kekchi, which explains ant invasion.

It seems that when the world was young, of all the people on the earth only the ants were prosperous. In an attempt to understand this situation, man, who at that time had the form of a fox, was chosen to follow the ants and unravel the mystery. The fox followed the ants and found them coming out of holes in a great cliff. Since the fox was unable to get into the cliff, a woodpecker was sent to find the hollow place where the ants lived. The woodpecker, boring a hole in the cliff, saw corn, but was unable to obtain any. As a last resort, the lightning was sent to blast the cliff. This was successful, the peoples of the earth obtained corn from the stores of the ant, and prosperity reigned everywhere. The ants, therefore, in stealing corn, are committing no crime, but are merely taking what once belonged to them. And, said Jacinto Cuz, as proof that this is all true, some kinds of corn are black, burned when the lightning blasted the cliff.

GOOD GLUE IS IMPORTANT IN MAKING FINE FURNITURE

Colonial Williamsburg, Inc., approved reproduction by Kittinger of this late eighteenth century sideboard in the Wythe House at Williamsburg, Virginia. The beautifully figured crotch mahogany veneers are applied with casein glue

GLEANINGS ABOUT GLUE

By E A. PARRY

HATS OFF to the fellow who first dumped the hides of cattle into a big pot and boiled them until the resulting liquid reached a state of magnificent gumminess. That man—his name, unfortunately, is lost in the mists of antiquity—was the first glue manufacturer. There is reason to suppose that he was a tanner by trade—hides and glue are natural affinities—and the chances are that his discovery was accidental, as so often happens. Certainly he knew nothing about the complicated chemistry that produces glue from a bull's hide, but an agile imagination soon hit upon the adhesive possibilities of his curious find.

We can thank inquiring archeologists who poke noses and trowels into bygone civilizations for the information that glue is an ancient product. The art of gluing was already well-developed when Thotmes III ruled Egypt fifteen hundred years before Christ was born. The Egyptians were such accommodating folk—they drew pictures of their arts and industries on enduring stone for the edification of us inquisitive moderns. On one of these old stone carvings, dating back to Thotmes III, a workman, brush in hand, is busily applying glue to a wooden base. The glue pot is on the fire and one end of a stirring stick is plainly visible. A piece of glue came to light when King Tutankh-Amen's tomb was opened. Hundreds of years of burial had dried it out pretty well, but there was not a thing the matter with its stickiness!

Animal glue is the oldest of the common adhesives. The skin, the horn and hoof piths, the bones, and the blood of the useful cow and her kin produce the glue that holds our chairs together, keeps the veneer on our table top, turns any two pieces of wood into a solid whole. And just for good measure, cow's milk is the source of casein glue, that excellent water-resistant adhesive, of which more later. Today other animal odds and ends find their way into the glue manufacturer's cauldrons: sheep ears, the skins of rabbits, cats, and dogs, parings of tawed leather, parchment, and even the old gloves you discarded —or lost!

Animal glue is hard, horn-like, somewhat transparent, and light- to dark-brown in color. It has a bulldog grip, but like a cat, it does not take kindly to getting wet. But the bulldog grip makes it so valuable that unless you live in a flood area or some such dampish spot, the animal glue that holds your furniture together is not likely to let you down. A good animal glue makes a good joint. It has great strength, it is free-flowing when properly heated, it does not stain, and it is as good on veneer work as it is on thick stock. Blood-albumin glue, a slaughter-house by-product, dark to very light red in color, is excellent for plywood and veneer. It is not absolutely waterproof, but it will stand a good deal of soaking before it softens.

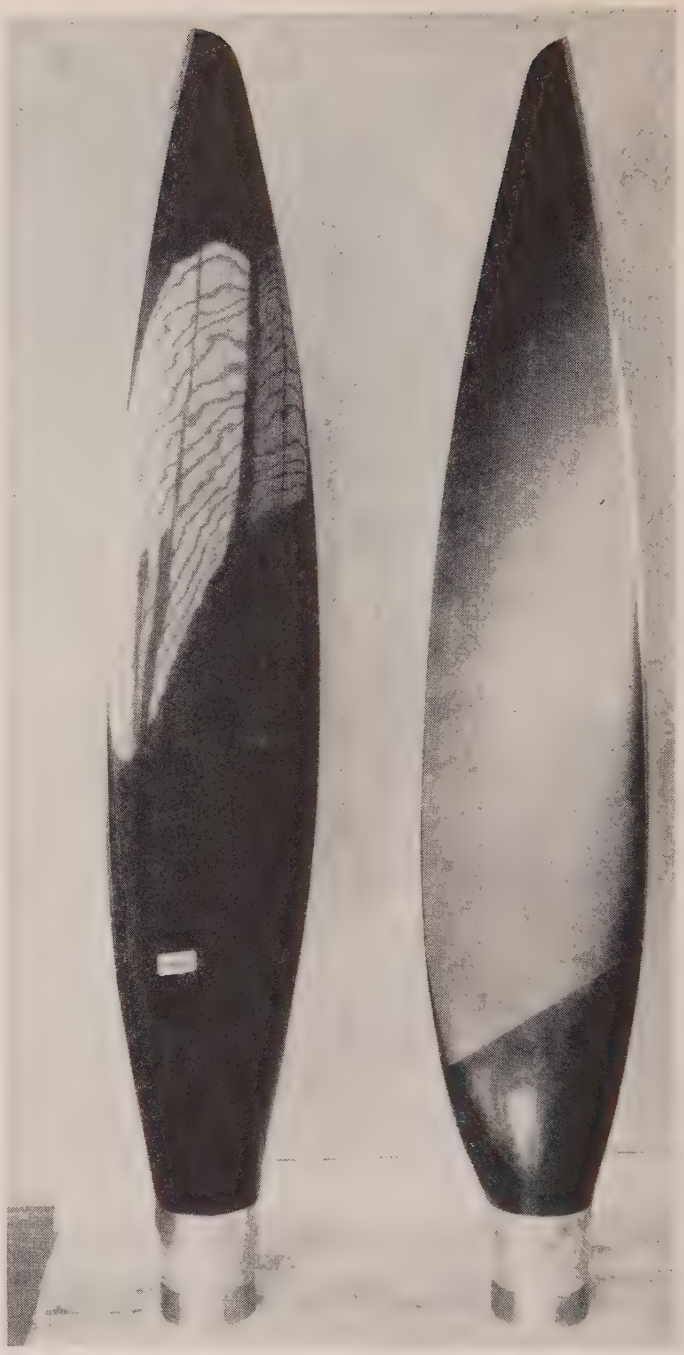
It may come as something of a shock to learn that glue, and the gelatine that appears on your table in various delectable dishes, are practically the same thing. The former is merely a less highbrow form of the latter, purity being the deciding factor. Both are proteins characteristically deposited in the tendons, cartilages, bones, skin,

and white connective tissue of vertebrate animals; and both are produced, to state the glue-making process in its simplest terms, by "boiling out" the agglutinating materials in water or dilute acids.

But animals are not the only sources of glue. Any housewife to whom has fallen the sticky job of separating cooked fish from its skin knows all about the adhesive qualities of the finny tribe. From the glue manufacturer's point of view a fish's beauty is only skin deep. It is the skin that is full of the organic substance—collagen, if you must know—that makes glue what it is. Fish bones and heads and guts also yield a glue of sorts, but they lack what it takes for a good sticky job. From the swim bladders of certain fish comes isinglass, which is a superior kind of gelatine, sticky enough, but much too valuable to be used as ordinary glue. You have met it in "court plaster," in various jellies, in India ink, in glass cement, though you probably did not recognize it!

Liquid or fish glue has many things to recommend it, but its smell is not one of them. Its ability to stick tight is not affected by its odor, however, and the addition of certain chemicals makes it easier on the nose. Fish glue does a good job in a small way and is ideal for not-too-large areas and patchwork, but it is not recommended for heavy jointing or veneering. Not that there are not first-class fish glues for major gluing jobs, but they are hard to come by, because liquid glue is one of the easiest things in the world to adulterate. And you can not tell from the smell, no matter how strong *that* is, or from appearance, just how good a fish glue is.

Now to get back to the cow and her milk. When milk sours, it clots. The thick stuff is casein. Remember Little Miss Muffet eating her "curds and whey?" Well, milk curd, artificially clotted and then dried, forms, among other things, the base of casein glue. Incidentally, cheese is a modified form of casein, but do not let that relationship spoil your appetite for Swiss on rye. Casein glue is a "war baby." It came into prominence during the World War in answer to a demand for an adhesive that would hold wood together in wet places. Airplane manufacturers promptly fell in love with it when they discovered that layers of thin plywood, with the grain criss-crossed, and glued with casein, withstood the jarring of engines, wrenching due to wind, the impacts of landings and waves, as well as fog and tropical heat.



GLUE PLAYS ITS PART IN PRODUCTS VITAL IN OUR NATIONAL DEFENSE PROGRAM

Above is a wood plastic composite aircraft propeller blade glued with casein glue, and made by the Engineering and Research Corporation, Riverdale, Maryland. Below we see what glue can do in making laminated wood arches for buildings

Casein glue, which is an innocent-looking whitish powder, needs only the addition of water to turn it into a highly

efficient adhesive. Easy to mix, easy to spread, water-resistant, and used cold, casein glue can boast of many virtues. Early casein glues stained acid woods, but this has been largely overcome by the production of special grades. And now, from the synthetics chemists' laboratory, comes a waterproof, moldproof, stain-free resin glue, easier to use and with as many advantages over casein as casein had over other types of glue ten years ago.

We like to think that the development of casein glue is a twentieth century achievement, but there is good evidence that the Egyptians knew and used it; certainly the Romans did, for the Emperor Trajan's pleasure ship, which sank in Lake Nemi about 100 A. D., was found with bits of canvas still glued to the hull with casein glue after hundreds of years of soaking in the water!

If you have vegetarian leanings, you may prefer vegetable glue, which really is something new under the sun. Starch is at the bottom of its ability to hold things together, the same starch that appears on your dinner table in the form of tapioca pudding. The best vegetable glue is made from the root of the cassava, an important tropical plant from which South American Indians make their staff of life, and from which we make tapioca—and glue. Vegetable glue is translucent, fairly colorless, and very tacky. It is cheap, it can be used cold, it remains in good working condition for several days, but it can not be spread by hand on any sizable job because of its extreme tackiness. It is not water-resistant and it stains through thin veneers.

Why does glue stick? For many years neither glue manufacturers nor glue users gave the question much thought. Glue stuck, and they left it at that. But there are basic scientific reasons why glue adheres, and the reasons are interesting. Do you remember the stick-together twins: COhesion and ADhesion? Even a bowing acquaintance with physics probably introduced them to you. When like particles of matter stick together, it is COhesion; when unlike particles stick, it is ADhesion. These are the two forces that operate when glue sticks. Thus: When glue is dry, all the glue particles or molecules have an overpowering affection for each other, but for nothing else. When, however, water is added to glue to soften it, this overpowering affection is weakened and the glue molecules are freer to use their attractive forces on something else. If the something else happens to be wood (or other suitable material), the glue particles penetrate its minute pores and cellular structure and become fixed there by the force of ADhesion. But this is only a temporary condition. As soon as the moisture dries out of the glue, ADhesion becomes weaker and the old brotherly affection of glue molecules for each other becomes stronger and stronger—the molecules tend to COhere. But they can not get back where they were before the glue was softened with water because the pores and cells of the wood have imprisoned so many of them. But the molecules pull together as much as they can, pulling the wood along with them. The result is a wood joint! How good the joint will be depends upon how effectively the glue particles are trapped in the pores of the wood—the surface must not be too smooth or too close-grained—and also upon how thoroughly the glue molecules stick to each other. Also, the glued surfaces must fit perfectly and be held by pressure while the glue sets.

Nowadays the term *glue* takes in a good deal of territory. It belonged, originally, to the adhesive made from animal products; it took in, later, the fish glues and, still later, made room for casein and vegetable glues. Moreover, today, various kinds of adhesive cements, mixtures of animal, mineral, and vegetable substances, tag along with the glues. Usually these fill some specific need. China, for instance, can be mended with shellac dissolved in spirits of wine, or with a compound of resin, wax, and plaster of Paris. *Japanese cement* for fine paper work is nothing more than rice-flour boiled with water. "Marine glues" are solutions of india-rubber, shellac, or asphaltum in benzene or naphtha, whose purposes are to exclude water instead of to make joints. Both the plant and animal kingdoms have contributed liberally to the production of glue, which does a big job in a most self-effacing way.

"I may not smell so very sweet,
Nor be a thing of beauty,
But most things would be incomplete
Unless *I* did my duty!"

•

Sight *By* LAVONIA STOCKELBACH

"Within three months, you'll be of sight bereft."
Appalled, I heard the awful verdict doom
My vivid life to everlasting gloom.
From duties as from pleasures am I cleft.
In black despair I question what is left
To make of weary hours a patterned loom,
When, lo! the happy children filled my room.
A flash of light! The warp has found its weft!
Mine eyes had seen this glorious world; and so
Can pierce with youthful gaze the darkling view;
Orion's winter course; the sheen of snow;
The crimson buds of maples; gentians blue;
The tasselled flowers of oaks; the morning glow;
A landscape mirrored in a drop of dew.

What Do YOU Call Them?

The localization of folk names is a fascinating study

By W. L. McATEE

LOCAL names are a constant delight. Their prevailing aptness shows us that the people who live close to the earth are good observers and pat describers, while their frequent quaintness entices us to better acquaintance with the Nature lore of the folk.

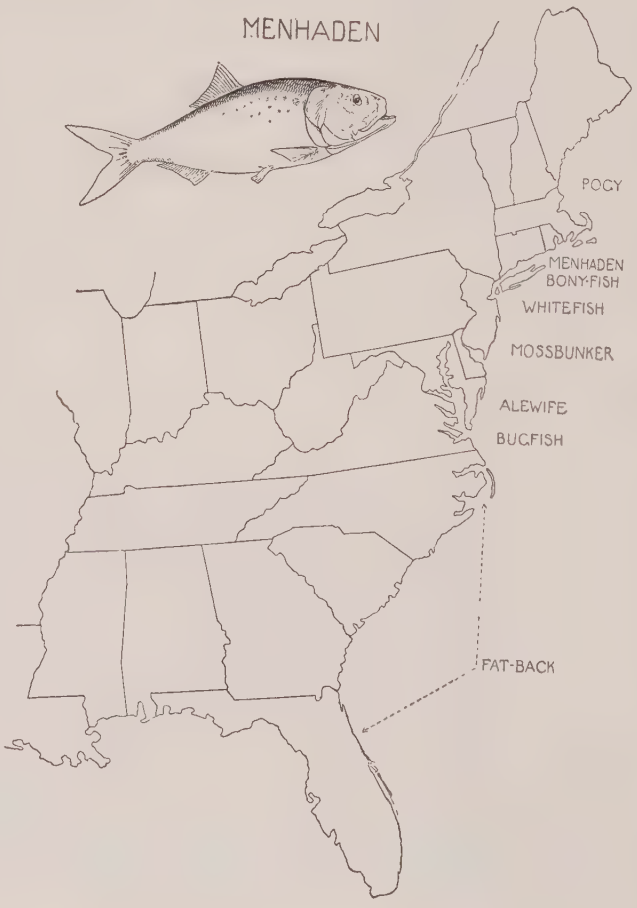
Most of us have had experience with the three-cornered burs so unesthetically called beggar-lice. For these flat, fuzzy seeds that stick so closely to our clothes, what more neatly appropriate name than "patches", a term I heard on Revels Island, Virginia? The tough, thorny vines known as greenbriers often show us that we cannot go plunging through thickets as we please. Their ability to hold us back and to take pieces out of clothing, or even skin, is recognized in several names that are more vigorous than elegant. But are any of these better than the whimsically humorous southern term, "wait-a-bit"? For sheer cuteness, I recommend "pinkletinks", given on Marthas Vineyard, Massachusetts, to the little piping frogs widely known as spring-peepers.

In the study of local names, the locality, of course, is of the essence. It enables us in many cases to trace a term to the speech of some race or linguistic group formerly inhabiting the area. In connection with its fellows, it shows us how far the influence of a certain dialect extends. Experience with folk names brings to light many examples of their ties with locality and of their historically valuable persistence. Improved communications, widely-circulated papers and magazines, and standardized education tend to destroy local nomenclature, but there are always some who carry on the traditions and some who learn from them. The possibility that regional folklore will thus be perpetuated is a comforting thought to those who value and love it.

As examples of the local naming propensities of the people, let us consider some sample animals—a worm, a beetle, a fish, a frog, and a bird. We will discover that folk-naming not only embraces kinds of creatures and plants, but also in some cases their parts and habits.

For the worm, a common, but we can hardly say well-known, animal, there are two cognomens, earthworm and angleworm, that are found chiefly in books, but which have scattered colloquial use. It does not come easy for our people to say earth when they mean just plain dirt, or angle when they mean something connected with fishing. They are much more likely to say dirtworm or fishworm, and both of these terms are current, the second perhaps most widely of all, with the alternative form of fishin[g] worm. Fish-bait is another term. To the same purpose, but more briefly, these worms are said to be called simply bait in southern Connecticut and in east Alabama.

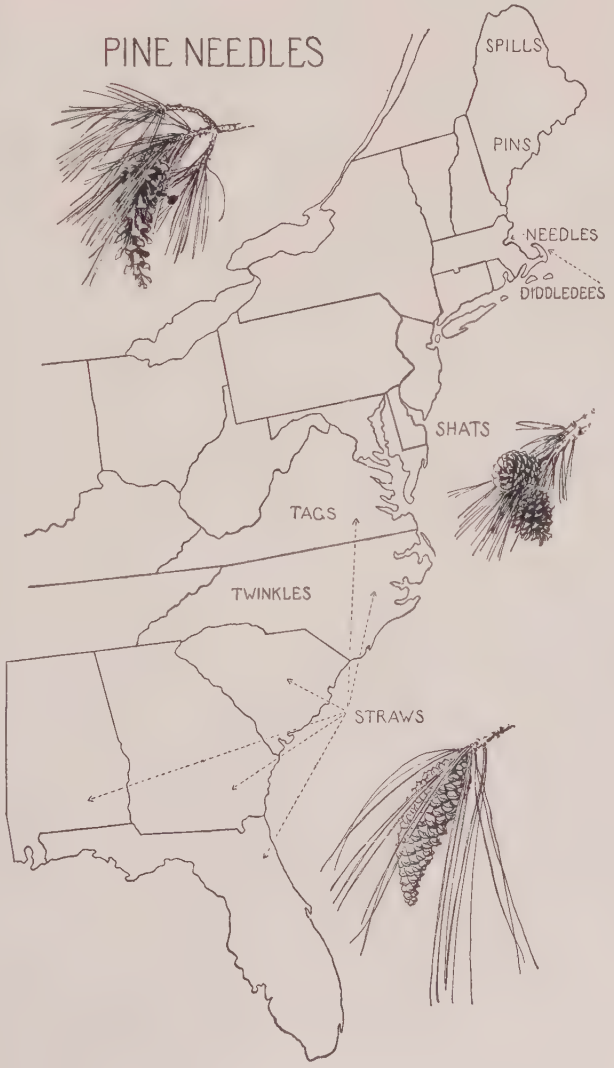
Angler is said sometimes to be used as a contraction of angleworm, of which anglerworm and angling worm are other variations, and the curious old term angledog may still persist. Professor Miles L. Hanley of the American Dialect Society generously writes me that: "Angledog . . . is a dialect word from Devonshire and Somersetshire [England]. When I was doing the field work for the Linguistic Atlas in western Connecticut, I had never met the word until I got to Simsbury; where my first informant, a very intelligent old gentleman of about 75, smiled and said, 'Well, you know, I was 30 years old before I ever heard that called anything but angledog.' My other informant in Simsbury, an uneducated speaker, really knew no word but angledog. The story as I see it is somewhat as follows: In the Plymouth Colony there were a number of dairy farmers from Devonshire. They were unhappy in Plymouth, especially because they had to feed their cattle hay cut from the salt marshes. They complained that it 'made the milk taste.' Just how they got to Windsor, Connecticut, I don't know; but they established one of the first three river settlements in Connecticut.



These were, as you know, Windsor, Hartford, and Wethersfield. From Windsor were set off South Windsor, Windsor Locks, Windsor Dam, Granby, Simsbury, and the northern part of Avon. In all these places, angledog is still used by the older generation. It is also found in certain places in Vermont, western Massachusetts, the Genesee Valley, and, I am told, the Western Reserve section of Ohio. So far as I know, every place where the word is known is a settlement that goes back to Windsor or some place settled from there. This is the kind of word that is particularly likely to keep a traditional form, since it is handed down from father to son and from fisherman to fisherman. It is not learned from books or from courses in zoology."

Professor Hanley helpfully comments also on the name eassworm (eesworm) known from New Hampshire, Massachusetts, and Rhode Island, saying, "My guess would be that the New Hampshire [and doubtless Massachusetts] settlement[s] from which you got it [were] settled from Plymouth County, Rhode Island, which seems to be the starting-place for the word in the U.S.A. In the Oxford Dictionary you will find listed the obsolete word easse, meaning food and connected with the verb to eat; consequently, food-worm or bait worm is the meaning. People who use it, having no idea of the original meaning of the word, commonly make up their own etymologies, and say east-worm, Easter-worm, or ease-worm; sometimes explaining that the worms come out when the wind is blowing from the East, or giving some other fanciful explanation. In Cheshire, Massachusetts, two informants spoke about 'ease-worms,' and each volunteered the information that 'they kinda ease 'emselves out of the ground.'"

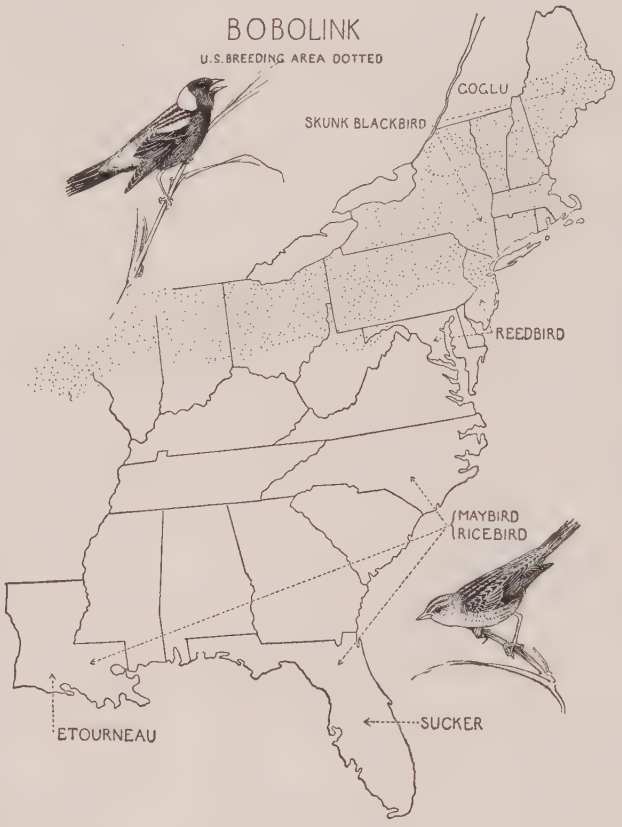
Other names and localities provide: dew-worm (southern Vermont), eel-worm (western Connecticut), garden-worm (Boston, Mass.), groundworm (southern Vermont), muckworm (Massachusetts), mudworm (New Hampshire, Massachusetts), and rain-worm (Pennsylvania). This last term is a simple translation of regenwurm, a German word doubtless used by the Pennsylvania "Dutch" (W. R. Walton). A group of appellations employed in southern New England includes night-crawler, crawler, night-prowler, and night-walker. These probably apply to a very common species that burrows for shelter but which feeds mostly on the surface. I have found the cognomen night-crawler current in Maryland and the District of Columbia. It is an apt term, for on rainy spring mornings we find these worms abundant on walks and pavements where they became stranded during their wanderings of the night. Years ago when bait fishing was more common, a minor local industry was made possible by the nocturnal above-ground activities of earthworms. In Washington parks at night colored boys, using lanterns, picked up the worms, which they kept with soil in small tin cans and sold to fishermen boarding the Cabin John cars for an excursion up the Potomac. These boys called the worms night-crawlers, and once, at DuPont Circle, I thought I heard the term night-lion. Whether this was a mere synonym or meant an extra large worm—an old "he-one"—I did not learn. Other ears (those of H. C. Gauss who has kindly aided me) have heard this term as night-liner, possibly in reference to the conveyances employed in the night life of Washington before the days of taxicabs. As Mr. Gauss suggested, some of the names here cited may apply to certain kinds of earthworms rather than to the group. He suspects that mudworm may mean a species that he has also heard called sewer worm. Redworm, he thinks, may be a common, easily-recognized species known also as manure worm. I have personal acquaintance with the use of both of these appellations for this smelly species in Indiana, and redworm has been reported from New Hampshire and from the Ozark Region in Missouri and Arkansas.



The beetles I wish to discuss were very appropriately called whirligig beetles by the eminent teacher of entomology, Professor J. H. Comstock. They are flattened, ovoid, shining-black little fellows that may be seen on quiet reaches of streams during the milder seasons of the year. Their trait that first engages attention is a swift and mazy circling over the surface of the water. Much of their time is spent in this frenetic dancing, beside which any human ballet is ponderous and slow. Comstock's name refers to

this fantastic spinning; whether it is a folk term I do not know but it may well be. Others that derive from the same activity are whirl beetle and water-witch. Both are names long known in New Jersey, the first recorded by Pehr Kalm, the Swedish traveler, in 1749, and the second by Jacob Green, a professor in Princeton University in 1833. Even the scientific term for this family of beetles alludes to their intricate gliding; it is Gyrinidae, derived from a Greek word meaning round or circular; gyrate, a fairly familiar word, embodies the same idea. Pehr or Peter Kalm's works were translated into various languages and in the process a whirl beetle became a *zweemer* in Dutch, and a *gyrin nageur* (circle swimmer) or *tourniquet* in French.

Among other characteristics of the whirligig beetles is that of emitting, when handled, an odor that is considered pleasant or the reverse, depending upon the perception of the observer. Those finding it agreeable have been the most vocal for they have called the insects sugar bugs (Maryland), apple bugs (New Jersey, Maryland, Indiana), and mellow bugs (Alabama). A linguist innocent of entomological knowledge has assumed that the name apple bug means that the insect attacks apples and he called it the apple curculio. Curculios, however, are very different beetles of the weevil alliance. Lest I make some similar blunder, I will not try to explain the names lackey bug and eel bug, which are given to the whirligigs in Massachusetts and North Carolina, respectively. Anyway, my imagination just now is not equal to the task.



In illustration of the localization of names of a fish, no better example need be sought than those for the menhaden, an abundant species that occurs along the entire Atlantic Coast, and which has been of direct interest to the people, as it has been used everywhere as a fertilizer since early times. In "A study of the popular names of the menhaden" (*American Naturalist,* 12, 1878, pp. 735-739) in which he lists some thirty terms, Professor G. Brown Goode of the Smithsonian Institution concluded that while "These names are not separated in their distribution by sharply defined boundaries . . . the *habitat,* if that term may be legitimately used, of each local appellation appears to be clearly marked."

Taking the names from north to south, we find that those chiefly used in New England trace back to Indian languages. When white men first came to this country they found the natives using these fishes to manure their cornfields. Their words for the fishes meant "that which manures," and one of them became pogy, in Maine and northern Massachusetts, and another menhaden, in southern Massachusetts and Rhode Island. In eastern Connecticut, bony-fish, a well-deserved term, prevails, and west of the mouth of the Connecticut River, white-fish. On the coast of New York and New Jersey, where the Dutch were so strongly represented in part of the colonial era, a word from their language is the source of the present day popular name of the fish, namely, mossbunker. About the coastal waters of Delaware and Maryland, the fertilizing fish is known as alewife, an English name for a similar-looking but distinct species. In Virginia, bug-fish is the word; it refers to parasitic crustaceans (not bugs, i.e. insects) that are often found in the mouth of the menhaden. From North Carolina to Florida is heard the term fat-back, embodying a natural allusion to the oily nature of the flesh of the fish. Here and there, even more locally, other names are given to the menhaden, but those cited are the most settled, and serve amply to show that in the realm of fish names, as with appellations for other organisms, the influence of locality is powerful in moulding the vernacular.

An animal that interested the colonists as much as any was the bull-frog. It was much larger than the frog of western Europe and its voice was a marvel to them as it still is to us. Not only the frog itself was the object of local naming, but its notes were given a number of interesting, if fanciful, interpretations.

Peter Kalm, before referred to, then at Rapaapo (now Ramapo), New Jersey, in May, 1749, wrote a long account of this frog. It is so interesting, and his language is so quaint, that we regret that his story cannot be quoted in full (Travels in North America, Forster Edition, 1771, pp. 170-174). Kalm recorded the names manteskor (Swedish) and bulkikker (Dutch) for these frogs, and a translator has added *grenouille mugissante* (bellowing frog). It was called ouaouaron (wawaron) in French Canada after an Indian onomatopoeic, or sound-imitating, word. This term also was taken to Louisiana by the Acadians. In the Northeast, most of the names applied to this species contained in part or in entirety the term paddock, a Scottish and Old English word for frog. Thus bull-paddock and bull-paddy are recorded as used

on Cape Cod, and bull-pad at Boston, Massachusetts. These designations seem to have had somewhat wider usage, as they are also rather indefinitely ascribed to New England. Bull-tucker (the second element of which may come from an old Scottish word meaning the sound of a drum) has been noted for Needham, Massachusetts, and Philadelphia, Pennsylvania. A facetious expression "Irish nightingale" is recorded for Newburgh, New York.

The "song" of the bull-frog suggested that term and it has been worded in a variety of ways, the most familiar of which is "jug-o'-rum." Others are: be-drowned, better-go-round, blood-'n'-'oun's (or bloodynouns), br-wum, more-rum, and Paddy-got-dhrunk. Despite these rather forbidding interpretations, the sonorous call of the bull-frog, heard in the quiet of a summer evening, is a pleasant sound—one that would be fully approved, one feels, by the genius of the place.

The localization of bird names is so evident that almost the whole of my bulletin on the *Local Names of Migratory Game Birds* (95 pp., 1923) may be taken as proof of it. From the numerous examples that might be selected, I choose the bobolink (no longer considered a game bird) because of the relative simplicity of its nomenclature. Some of the others, by contrast, for example, the ruddy duck with a hundred or more designations, would require considerable analysis.

The bobolink, with the sexes of strikingly distinct coloration in summer but alike in winter, beneficial in the breeding season but more or less destructive in migration, and with the male singing deliriously both from perches and on the wing, attracts attention wherever present. Formerly, when rice-growing was an important industry on the South Atlantic Coast, flocks of bobolinks in fall migration were tremendously destructive and were known as ricebirds. Rice-growing is now unimportant in that region and the bobolink is of far less consequence. However, today, as formerly, it damages other grain crops as the flocks come north in spring, and from the season is denominated Maybird. Listed in geographical sequence, the more characteristic names are: goglu (from the notes), Quebec; skunk blackbird, New England and New York; reed bird, New Jersey to the District of Columbia; ricebird (fall) and Maybird (spring), North Carolina to Louisiana; and etourneau (starling), Louisiana. Several other interesting terms, mostly of more restricted use, are: army-worm bird, Missouri; ortolan, New Jersey to Louisiana (the true ortolan is a European species of bunting, a gastronomically famous bird, whose name has been applied to a number of other species favored by epicures. Vast numbers of reedbirds were once used for food); oatsbird, Florida; strawberry bird, Connecticut, and sucker and wheat-bird, Florida. The term sucker refers to the bird's feeding on grain in the milk, when most damage is done. It is clear that if a Floridian were asked what the skunk blackbird is, he would be nonplussed, and so would the New Englander if quizzed about the rice sucker. As a rule each section creates names for the creatures it has need to consider and keeps them. Import or export are neither great nor sustained, and in fact may not occur at all. The resident remains undisturbed and comfortable in his vernacular habitat, and the stranger has enjoyable experiences in the discovery and understanding of unfamiliar but often highly interesting terms.

Now for an example from the plant world. The traveler on the usual vacation route along the Atlantic Coast can scarcely fail to note differences in the pine trees that in many areas dominate the landscape. Even those least interested in Nature will be impressed by the columnar trunks and long leaves of the southern pines, so different from the more irregular boles and stubby tufts of the New Jersey and Maryland trees. A closer observer, going from Maine to Florida, can recognize belts of at least six kinds of pines, the white, pitch, Virginia, loblolly, longleaf, and slash pines, and there are others occurring in lesser abundance. Not only do these trees, like so many other plants, have distinctive local names, but remarkably also there are names for their leaves corresponding to the principal types, and thus sharing the interesting geographical distribution of the trees themselves. In northern Maine, spills is the indigenous term for the leaves of pine, those of juniper being known as shives. At about the middle of the coast of Maine, I have heard the word pins used fittingly for leaves of the genus *Pinus*. What we may rank as the normal appellation as it is in general, at least general literary, usage, is needles. For the slender, pointed, and bluish-hoary or steely leaves of the white pine it is very appropriate; it is prevalent in Massachusetts. Folk peculiarities have their way even there, however, for we find on Cape Cod the puzzling alias, diddledees. The Eastern Shore of Maryland yields a precinctive name for pine needles (as it does for so many things) in shats, meaning, presumably, things that are shattered down. In much of the coastal plain of Virginia, we find the designation tags; in the mountains of western North Carolina, twinkles; and throughout the range of the longleaf pine from extreme southeastern Virginia to Florida and southern Alabama, straws. This term is applied chiefly in the collective sense, as straw, and the fallen leaves of the pine are used for the bedding of domestic animals, for packing, and for other things for which grain straw is employed in regions where it is plentiful. The needles of the longleaf, being as much as 12-16 inches long, serve very well many of the uses of cereal straw. One may fancy that the words tags and shats, prevalent in neighboring areas where the pine needles, though shorter, are still used in much the same way as those of the longleaf, implicitly acknowledge their different and inferior qualities.

The series of names for pine leaves, partly connected with their qualities, partly reflecting peculiarities of dialect, is very interesting, possibly unique. It may perhaps be fixed in mind by a parody of an old riddle chant:

Spills and pins and needles,
Straws and tags and shats,
Diddledees and twinkles too,
How many leaves is that?

The people are likely to regard scientists as being too free in bestowing names, but the truth is that both groups share a desire to have distinct names for all distinguishable

things. For example, there is a different name for the meat of each of the principal domestic animals, pork, mutton, beef (veal makes two in this case), and fowl. The cries of each of the farmyard familiars are distinguished, as bellow, bleat, whinny, squeal, bark, cluck; in fact several different sounds made by each creature are named. In older days this system of close naming was extended to all animals that were objects of the chase, and there were different terms for their footprints, their spoor, for their habits in going to rest or burrowing, for their mating, and so on. In fact mastering the phraseology of a given pursuit became a career in itself. Specialists were required and so they are still, even though many of the older terms are forgotten. The people make classification and nomenclature; scientists only extend and perfect them. In fact, in their own field of vernacular names, the folk have invented so many names that the scientists have never adequately collected and arranged them. The appellations mentioned in this essay are only minor samples of the fruit of the ever-bearing and prolific tree of folk language.

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Tionesta Area Set Aside

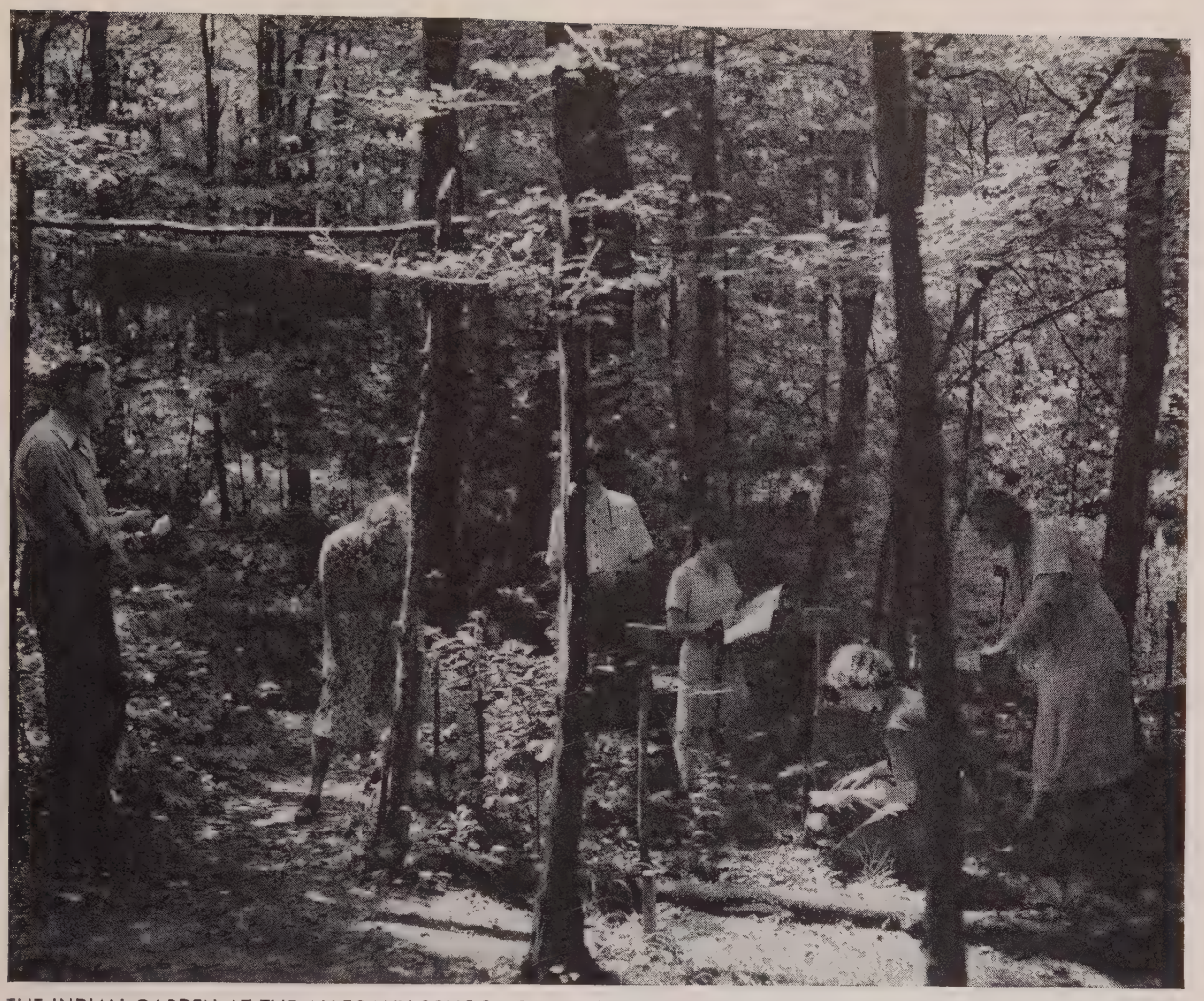
By A. F. HOUGH

NATURE enthusiasts and others interested in preserving the rapidly vanishing areas of virgin forest in the East will welcome the news that 4131 acres of original hemlock-hardwood forest, purchased in 1934 by the Federal Government for inclusion within the Allegheny National Forest in northwestern Pennsylvania, has been formally set aside by the U. S. Forest Service for scientific use and for the education and enjoyment of the public. The purchase of this forest was advocated by far-seeing conservationists and foresters and vigorously promoted by the Pennsylvania Forestry Association and the late Chief Forester, F. A. Silcox. It is virtually the last large example of its type in the East and also the largest compact body of virgin timber between the Adirondacks and the Great Smoky Mountains.

This forest is located between the east and south branches of Tionesta Creek, a tributary of the Allegheny River, about seven miles south of Ludlow, Pennsylvania. The purchase and reservation of this priceless remnant of our former forest wealth is an important forward step in the U. S. Forest Service program of preserving natural areas characteristic of native forest and range vegetation in all regions of the United States.

In its administration of this area the Forest Service recognizes two major obligations. First, to preserve the native plant and animal life in its natural state insofar as this can be done on an area of this size, and second, to allow the public to enjoy its unique qualities without jeopardizing their perpetuation. For this reason the area is divided into two parts; the northern portion, consisting of 2018 acres, is designated as the Tionesta Scenic Area and will be made accessible to the public by road and foot trails. Here the inspiration and true recreation to be found in a fairly large area of primeval forest may be enjoyed amid towering hemlocks 300 to 500 years old and veteran beeches of 350 years. The southern portion, consisting of 2113 acres, is designated as the Tionesta Natural Area, and is dedicated primarily to scientific research. This area is admirably suited for studying the development of the climax type, the natural rejuvenation that results in the perpetuation of the climax, and the response of the climax forest to climatic and biologic cycles. It is equally valuable for studying how completely the virgin forest supplies the life needs of the various animals found therein, and of how the forest with its multitude of different plant and animal forms influences the local climate, the soil, and the regimen of streams.

The Allegheny Forest Experiment Station can supply those interested with further information.



THE INDIAN GARDEN AT THE ALLEGANY SCHOOL OF NATURAL HISTORY
In it, carefully marked for identification and description of use, are many plants that served for food, medicine and other purposes in the lives of the northeastern Indian tribes

We Made An Indian Garden

A conservation project of interest and importance

By WILLIAM P. ALEXANDER

Photographs from Buffalo Museum of Science

That the many ways in which native plants were used by the aborigines of this country might well be included in the expanding field of Nature study was an idea that, after germinating in the writer's mind for many years, literally came into bloom a dozen years ago, when an Indian Garden was established at the Allegany School of Natural History in Allegany State Park, New York. It is an idea that can be put into use by any interested teacher and one that will be the source of unending adventures.

The summer "School in the Forest," well known for its unique day-long college credit field courses in natural history, provided a background for developing the Indian Garden as nearly ideal as it would be possible to find in New York, and the work was carried on throughout the six-week session. It can be carried out on such scale as is convenient for the teacher undertaking it, or it can be made a school or community project. A description of the Allegany School's Indian Garden can best serve as a series of guideposts.

The site of the School is not more than nine miles removed from the Allegany Reservation, which, occupied by a branch of the Seneca Nation, is in a beautiful region, the home of the red man from time immemorial. It was from this locality that many of the plants used in the School garden were derived. The Allegany School itself is literally buried in the forest at a higher elevation than the Reservation, on ground over which the Seneca plant hunters have long roamed, and over which they still search for wild things that grow in the mountains. In the fine grove extending behind the Nature study classroom, the Indian Garden was laid out. It was purposely made small, the width of the building and a length of about thirty feet comprising the plot. This was enclosed by a simple rustic

A WOOD SORREL PLANT

This was an important source of dye for the Indians. Crab apple, high-bush cranberry, wild indigo, bloodroot and black walnut were other dye sources

fence and furnished with a similar arched entrance, making an effective arrangement that harmonized entirely with the surroundings. On one of the entrance posts was placed the little master label, which indicated the purpose of the Garden and which reads as follows:

"From the vegetation of the wilderness, the Indians derived much of their food and the materials which they employed in their domestic arts. The forest was their uncultivated garden, and from it they gleaned tasty and nutritious foodstuffs, fibers for textiles and cordage, fine dyes, medicine, and plants which played an important part in their tribal ceremonials. Many of the species so used by Indians are in this little wild garden. Please keep to the path, and be careful how you use your feet in this outdoor museum."

Nearly one hundred and fifty kinds of plants were set out in the Indian Garden, each with a label giving the common and scientific names and information concerning the manner in which the red man employed the species. The information written into these labels was gleaned from the standard literature on the subject, or obtained from reliable informants living on the Allegany Reservation. The actual handling of the plants, the study of their ecology, the digging, transplanting, and looking after their needs in the garden, provided Nature study methods that made this innovation in teaching an outstanding success.

Many Indian tribes, and particularly those inhabiting the eastern part of our continent, were excellent tillers of the soil long before the discovery of America by the whites. They grew maize, beans, melons, squashes, and pumpkins in well-prepared fields, much as they are grown today. The white man learned how to grow these important food plants from the Indians, and he has not added much to the knowledge imparted by the red farmers, at least concerning the cultivation of corn and beans.

That the Iroquois had another way of preparing small uncultivated gardens, the writer is fully convinced. In many localities in central and western New York, along many of our larger streams where fertile flood plains exist, one suddenly comes upon rather extensive patches of a once-favorite food plant of many tribes of Eastern Indians, the so-called Jerusalem artichoke. In these patches, associated with these artichokes, the groundnut and hog peanut are almost invariably found, and not infrequently with these are wild onions, Solomon's seal, and Indian turnip as well. These plants all furnished root foods for the red man and, being persistent perennials, hold the ground for years when once established in places where fertility is constantly renewed, as it is on typical flood plains. The discovery of the several species of plants recurring again and again in such combination forces one to believe that they were planted in these situations by Indian women for the convenience of harvesting them, and that these patches are real remnants of ancient Indian wild gardens enduring to our time.

An old informant on the Allegany Reservation told the writer that the Senecas no longer eat groundnut, artichoke, or Indian turnip, but he nevertheless was of the opinion that my conclusions might well be a true explanation of the artichoke association described. The Iroquois, in their quest of food and medicinal plants, have always practiced a ritualistic husbandry in taking plants from the forest. The herb doctors, for example, performed a traditional rite before gathering the species they needed, and part of this rite consisted in chanting a song of requital, a portion of which indicated their conservation policy. They sang:

"I will not destroy you but plant your seeds,
Plant them in the hole from which I take you."

It is to be hoped that the white man will some day learn thus to play fair with uncultivated vegetation. Even now, the Seneca hunting for ginseng in the mountains would not think of digging the plant before the berries contained ripe seeds that could be sown on the spot.

The plants chosen for the Indian Garden at the Allegany School were, with few exceptions, species uncultivated today, and for the most part representatives of our

native flora. The various kinds were treated in groups according to the way they were used by several tribes that occupied the range covered by the many plant species collected and studied.

Several kinds of Solomon's seal, wild ginger, Indian cucumber root, arrowhead, milkweed, groundnut, cat-tail, Indian turnip, wild leek, wild onion, and skunk cabbage, all furnished roots, underground stems, bulbs, and the like that were eagerly sought as valuable foods by the Indians. They did not serve to replace staples like the Jerusalem artichoke, but many of them were prime favorites and added variety to the culinary preparations of Indians. Even the fiercely hot corm of jack-in-the-pulpit, and the ill-smelling rootstock of skunk cabbage, were made wholesome, and even tasty, by careful preparation. Stems and leaves of many plant species were relished by the aborigines, and these were eaten cooked much after the manner in which asparagus and greens are made ready for the table today. Some of the kinds thus consumed were pokeweed, burdock, milkweed, smooth sumac sprouts, pigweed, yellow dock, sorrel, mustard and the tender green sprouts of berry bushes.

Wild fruits, of course, ranked high as food among the Indians everywhere, and, preserved and dried for winter, many kinds added enjoyment to the fare of the natives, even as they do to the white man now, when the earth is barren in winter. Fruit-bearing plants introduced in the Garden were mandrake, grape, wild plum, wild crab apples, chokecherry, black cherry, blackberry, raspberry, nannyberry, high-bush cranberry, strawberry, gooseberry, June-berry, elderberry, wintergreen, currant, and others.

The Iroquois tribes, inhabiting forested regions as they did, naturally placed considerable value upon nuts and acorns as wholesome articles of food. Meal was made from the meat of a number of nuts, and even the tannin-charged acorn, after proper treatment to remove the bitter principle, could be pounded into flour that made both a well-flavored and nutritious bread. The nuts of some trees also yielded oil copiously, and this was used in cooking. Hazel, hickory, chestnut, beechnut, butternut, black walnut, and red and white oaks were placed in the Garden as examples of important plant species yielding nuts and acorns, but blue beech, hop hornbeam, and basswood were also given a place, even though the nutlets they bear are small and seemingly hardly worth considering. Sugar maple held an outstanding place because of its importance as a source of syrup and sugar, but its fermented sap also yielded a vinegar that the red man found to his liking.

Of medicinal plants used by the North American Indians, the more valuable kinds were selected for representation in the little Garden during its first season. The list, which is one of considerable length, can be added to. Wood betony, spikenard, sassafras, calamus, sheep sorrel, lobelia, wintergreen, ginseng, wild geranium, boneset, Oswego tea, and witch-hazel were given places of honor, inasmuch as many tribes have set the stamp of approval upon their real or imagined healing virtues. Some of these plants, which were used by Indians from time out of memory, now have a recognized value among white races,

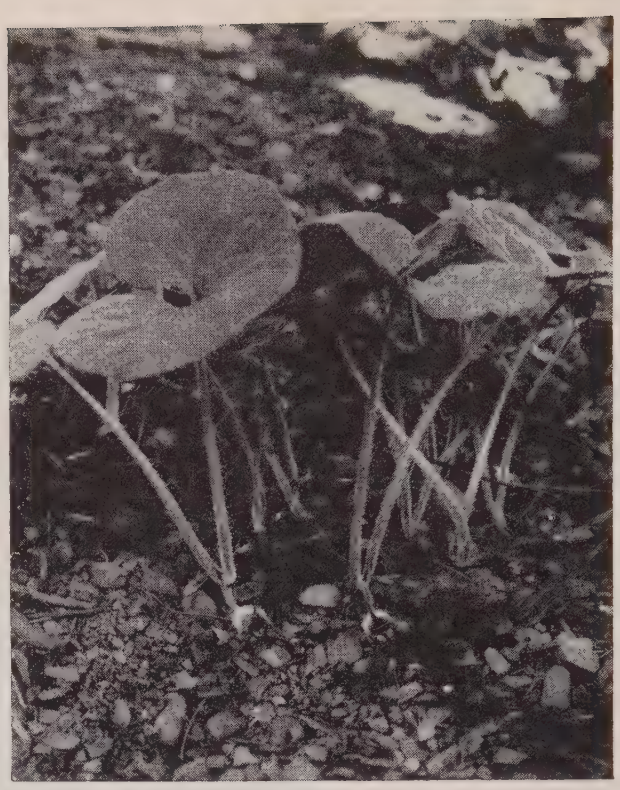
INDIAN TURNIP, OR JACK-IN-THE-PULPIT
This served the Indians in their diet, and despite its fiercely hot corm, they were able to prepare it so that it would be a tasty item

and a number of the usages, such as using witch-hazel as a soothing lotion, were learned from the natives by the pioneer whites in this country. The red men knew that the juice of the succulent jewelweed, if applied to insect bites, would allay the irritation, and the plant growing in the Indian Garden bears a label conveying that agreeable information. And interestingly enough, it works!

The red man needed dyes and puccoons, or war paints. He found them in the bark, leaves, fruits, stems, and roots of wild plants. The crab apple gave him a golden-yellow dye; the high-bush cranberry, a purple; wild indigo, a blue; bloodroot, a red; black walnut, a brown pigment, and so on. These and other dye and puccoon-yielding species are in this outdoor museum. The Indian needed cordage for fishlines, netmaking, and for innumerable other uses. The forest gave him the materials with which to satisfy his needs. Swamp milkweed, the inner bark of the linden, the

unrivaled bark of leatherwood, Indian hemp, nettle, sunflower, and other species gave up strong fibers, and the Indian handled them in much the same fashion that people the world over handle plant fibers in the art of making rope.

Pipes were apparently fashioned in the earliest times of human occupation of this country, and something in the nature of tobacco was presumably used by the men who shaped them. Indians did use real tobacco for smoking, but they also used many substitute plant materials often mentioned as kinnikinic. The leaves of a small lobelia and of bearberry, and the bark of willow, and silky and red-osier dogwood, are familiar examples of kinnikinic. These substances were actually smoked, but a ceremonial tobacco was made from the cardinal flower, which was used in various ways but never burned. Many other plants that found a place in the Indian Garden could be listed, but enough examples have been given to indicate its scope and usefulness.



WILD GINGER IN THE GARDEN

This was one of the many plants that served the Indians as a source of medicine

First-hand knowledge of the uses made of plants by Indians in former days has been gained by the writer from friends that he has made among members of the Seneca Nation living on the several reservations in western New York, and he wishes expressly to acknowledge his indebtedness to Chief Chauncey Warrior of the Allegany Reservation for his long continued and valuable help in this field of inquiry.

Through the years since the establishment of the Indian Garden, additional plants have been given a new home there. It has become not only a drawing card for students, but also one of the show places of the Park and of the School, which is conducted by the Buffalo Society of Natural Sciences in cooperation with The University of Buffalo and the Allegany State Park Commission.

Readers are cordially invited to visit the Indian Garden and the School's other two gardens—the Water Garden and the Fernery—during the coming summer. The school grounds are now open throughout the season, and you will be welcome at any time. A few hours' first-hand study is worth more than all the reading you may be able to do. The latchstring is out!

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The Proboscis Monkey

By EDITH M. LAING

THE GREATEST attraction at the zoo is undoubtedly the monkey cage. But among the numerous fascinating varieties there we never see the one pictured on a stamp of North Borneo, for the proboscis monkey, *Nasalis larvatus,* does not live in captivity and must be seen at home.

These monkeys, when young, have ordinary snub noses. The grown female retains the same style, but the adult male develops on its fleshy face a projection at least three inches long, wrinkled at the base, and a real toper's red in color. It is inclined downwards over the mouth in such a way as to handicap its owner in eating. Eating, he has to use one hand to hold his nose out of the way.

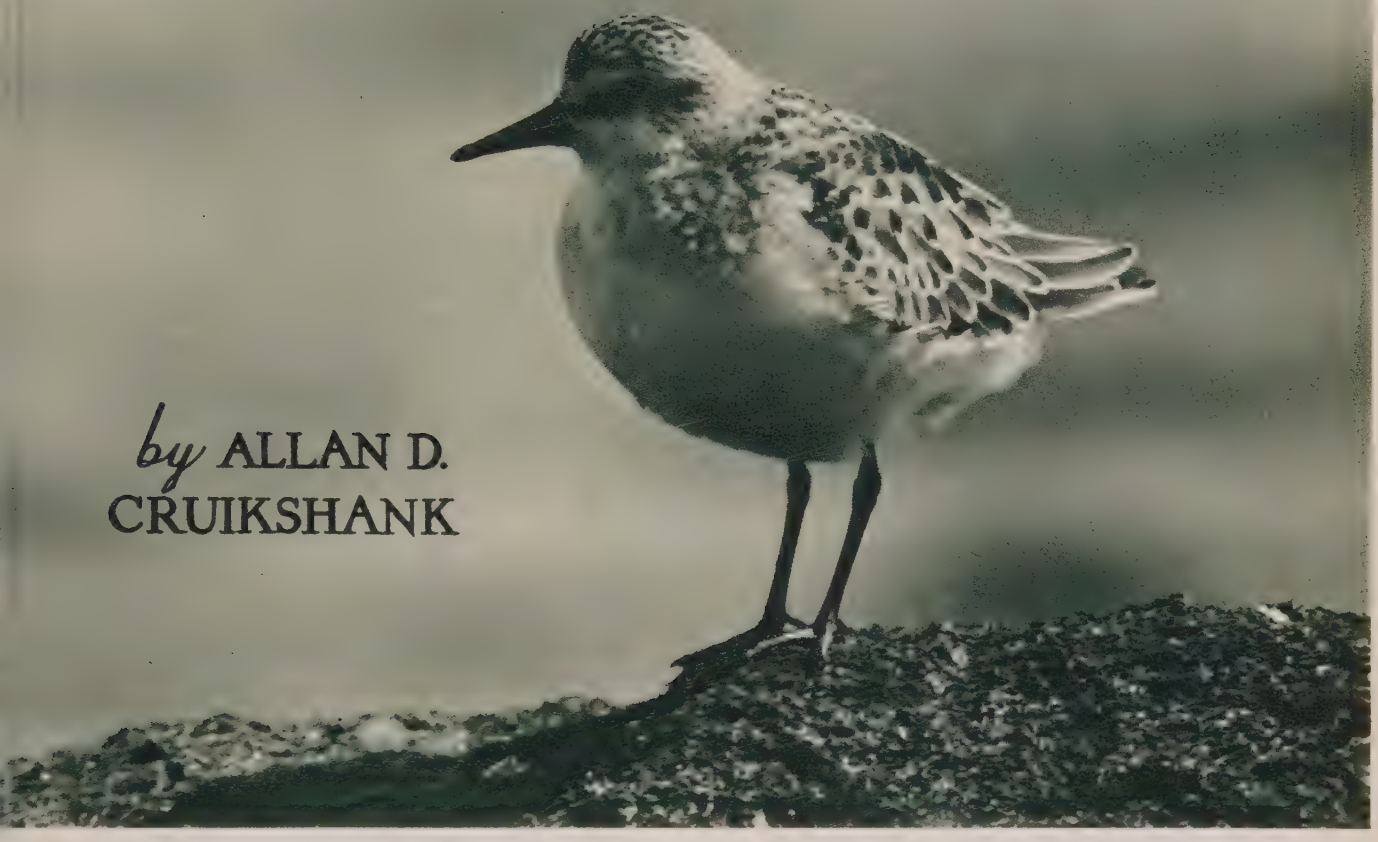
Of course Nature has reason for even the strangest contrivances, and in this case the apparently overgrown nose acts as a vocal sounding board when the males of the tribe go a-wooing, or honk a warning signal. One writer says the vocal effect resembles that of a bass viol.

The slant of this grotesque nose and the cut of the bushy sideburns combine to give the impression of a sour individual looking down his nose in a state of perpetual disapproval. The thick fur of these animals is striking in color. Back and sides of body and face are in varying shades of cinnamon brown; the throat and belly are white.

These peculiar monkeys live in small troops in forest trees along the river banks of Borneo, feeding on certain fruits and tender shoots. Eric Mjoberg in his interesting book *Forest Life and Adventure in the Malay Archipelago* records that in accordance with their usual genius for applying apt names, the Malays of Dutch Borneo call these monkeys orang hollanda—dutchmen!

FROM A CAROLINA BLIND

by ALLAN D. CRUIKSHANK



Semipalmated sandpipers were among the fourteen species of birds observed and photographed by the author from his blind on the shore of the Federal Wildlife Refuge at Bull's Island, South Carolina

It was past noon when I placed a score of dead fish eight feet from my well-camouflaged blind on Jack's Creek. The chances of attracting vultures to this feast seemed excellent, but vulture photographs were all I anticipated. Yet the following day I had fourteen species of birds partaking of the feast, and some of these birds I had never thought of as scavengers. One seldom associates greater yellowlegs, turnstones, willets, black-bellied plovers and sanderlings with carrion. Yet they were the first to be eating; fighting for, jealously guarding their claims. It was interesting to see a willet claim possession of an eighteen-pound channel bass, and determinedly driving off any shorebird that approached. The only one that dared question his right was a black-bellied plover, but the willet proved dominant. The frustrated plover subsequently turned to dominate and chase the yellowlegs, turnstones and sanderlings from other pieces of fish.

An hour after I got in my hideaway the more timid birds commenced to edge back to the feast. Four fish crows sailed over and drove all the shorebirds, even my dominant willet, away from the fish. But the social life of birds is complex and actual dominance is only for a few. A common crow bossed his smaller relatives until some herring gulls approached and took possession of the food.

Slowly and silently I swung my camera towards a Bonaparte's gull that stood patiently in the shallow water waiting to snatch scraps that floated out. As I extended the bellows to get perfect focus, the water reflected in one corner of the ground glass rippled and the Bonaparte's gull edged out of the picture. Then I saw two legs come into focus, one with a blue band and the other with a green band above an aluminum band. A herring gull we had banded last summer at the Audubon Nature Camp in Maine was now with me in the Federal Wildlife Refuge on Bull's Island, South Carolina. Four species of gulls were soon fighting over the food. The ring-billed and Bonaparte's gulls could only snatch small pieces from the periphery of the pile, but an immature great black-backed gull, a relatively rare bird this far south, chased the herring gulls from any fish that took its fancy.

The crows circled about, scolding. One brave fish crow periodically edged in, snatched a scrap and was off, pursued by a whole flock of crows, and, at times, a ring-billed gull. A common crow, perched on a post above the feast, talked in the most human way for fully ten minutes. What he said to the gulls neither the gulls nor I will ever know, but it certainly was the most serious and expressive lecture I have ever heard in the avifaunal world.

Air whistled through wings. A heavy thud came behind my blind. Then another, followed by a dog-like "woof". The shorebirds flew down the creek, the sad plaintive

note of the black-bellied plover the only sound of protest. The gulls walked off into the water. With a ludicrous gallop, two black vultures came to the food. The family name of vultures (meaning cleanser or scavenger) was well chosen, I thought, as I watched the professional technique in cleaning the bones.

Then out of the sky came twenty-three more black vultures. All other species moved farther away, except the fish crows. They walked in amongst the vultures and were not attacked. There was great variation in the character of the black vultures. Some stepped aside without protest when another came over to its food. Others put up a stubborn fight. Others threatened but then sneaked off. At times there were active fights. Like angry roosters two vultures would lower their necks, feint, and pile into one another, hissing and growling wildly. Bills and feet worked fast and furiously. After several such encounters one bird would try to get out of the fight by jumping a short distance off, but the victor charged the vanquished. Then the two, leaping across the mud flats like clowns, took to the air, and, after a short chase, circled back to the feast.

Like miniature gliders two turkey vultures sailed across the creek, wheeled above the fish, settled a short distance up the creek and slowly walked down amongst their dark-headed relatives. While the black vultures fought amongst themselves, and the turkey vultures amongst themselves, I never saw the two species actually involved in a clash.

Two turkey vultures (above) sailed in to enjoy the feast, feeding along with their relatives, the black vultures (left). If a black vulture insisted on pecking at a piece of food claimed by a turkey vulture, the red-headed bird would lift the food, when not too heavy, and carry it off to one side. From time to time two black vultures would approach one another and pick bills as though cleaning off scraps of food, and would rub heads and necks amiably against one another.

A Bonaparte's gull sails softly on the water, bobbing gracefully on the swell, while inshore a greater yellowlegs stalks beside the meal of fish set out by the author to attract birds before his blind

All at once there was a sudden hush. The gulls flew silently but quickly across the creek. The crows hurried off to the dike. The vultures stopped eating, looked up and gave low intermittent grunts. An adult bald eagle sailed above, circled slowly a hundred yards down the shore, and landed. He walked out in the water, picked up a floating piece of fish and brought it ashore to eat. The vultures around my blind commenced to eat again. The gulls glided back and stood around waiting. All species had exhibited great respect for the eagle as it flew over. Now they seemed reassured. Two black vultures galloped over towards the eagle and watched with interest from a safe ten feet. One fish crow, the bravest of the flock, got two feet in front of the large bird and scolded. He

Fish crows and black-bellied plovers joined the fish line, the latter not usually associated with carrion. Also the great black-backed gull takes a look at the wealth of food

even tried to grab a piece of the fish but nervously jumped back. Then this same fish crow circled the eagle and much to my astonishment took a quick peck at its white tail. The eagle looked up with apparent disdain and went right back to the feast. For twenty minutes I watched and hoped. Then the eagle took off. The gulls sailed out on the creek. The vultures stopped eating. There was silence and alertness again until the eagle disappeared over the cabbage palmettos.

It had been an exciting day. Little wonder I passed three more eight-hour periods in this same blind watching, taking down notes, obtaining photographs, ever hoping that one of the eagles would come near enough to be recorded in some striking pose on my Graflex.

Mother Opossum with seven of her offspring on her back. She is, however, carrying ten, for three of her brood are still in her pouch. At the bottom of the page are the typical 'possum tracks in the mud, distinguished by the opposable great toe marks in the impression of the hind feet

Opossum

By CHARLES W. AND ELIZABETH R. SCHWARTZ

Photographs by the Authors

The opossum is such a common animal that we forget how really unusual it is. Its distinction comes from the fact, of course, that it is our only American representative of the group of animals known as marsupials—those having a peculiar abdominal pouch in which the young are carried for a time.

Madame Opossum gives birth to a family of from five to fourteen, and they are born in an early stage of development as compared with other mammals. That is where the marsupium—the abdominal pouch—serves its purpose, for into it the immature young crawl. Here they nurse, grow and develop, protected in a warm and movable nest. By the time they are five weeks old they can climb in and out of the pouch. By clinging to the mother's fur with their claws and tails, they learn to ride on her back, legs, tail and neck. As they grow they reach a stage

when they cannot all fit into the pouch, hence they ride outside. The mother carries them until they become too large for this method of transportation. Then they have to follow her. When they are two months old, they become independent and, one by one, learn to shift for themselves, although they may remain in the home vicinity for a while.

Opossums climb trees easily by using their opposable great toes and prehensile tails, and occasionally they may be seen hanging from a branch just by their tails. They live in hollow trees, holes in the ground, or rock crevices, and spend most of the day sleeping in their homes. At night they come out in search of food and water. Because of this nocturnal habit, they are seldom seen. But if you keep your eyes open while passing along trails in the woods, and especially along streams, you may find their tracks and be able to learn quite a bit about them. Impressions of the opposable toes on the hind feet make a good sure identification for opossum tracks in the mud or snow.

Another interesting thing about them is their ability to "play dead", or "play 'possum", when cornered by an enemy. Whether or not they undergo nervous shocks is not known, but they retain enough consciousness to escape at the first opportunity. Although opossums are rather stupid they are well adapted to their environment and successful enough in it to be common.

View of the marsupial pouch with the young in it. While opossums usually remain in their dens during heavy snows, now and then they venture abroad, as evidenced by the track in the snow, identified by the trail left by the tail as it swept from side to side

THE WHISKERY WOOD-RAT

By TED TRUEBLOOD

Photographs by the Author

Using the name "rat" for friend "Whiskers" is really unfair, for it conjures up a picture of the filthy, disease-bearing rats of wharf, city cellar, or ship's hold. He belongs to a different family, and he and his relatives have bushy tails, much like those of squirrels. Although some of his cousins have tails that are less bushy, they are all clean, inquisitive and intelligent little creatures.

The species pictured is *Neotoma cinerea*, better known as trade-rat, or pack-rat, for his habit of collecting things. In fact, the night before these pictures were taken, "Whiskers" and his family got away with a bucket of apples, one by one, and he must have had a guilty conscience when he posed for me. All the western wood-rats are busy fellows, inveterate builders who are continually adding to their huge nests of sticks, straw, hair and feathers. To this storehouse they add anything that strikes their fancy, and they seem often intrigued by bright objects left around the camp or cabin. The story that they leave something in place of what they take is partly true, but it is not a deliberate act. The logical explanation is that they spot something they like better than what they happen to carry at the moment, and leave it for the more alluring object. Campers who miss things around the place can usually find them by hunting out a wood-rat nest where they may find the item carefully built into it.

Although cleanly in habits and diet, wood-rats do have a rather offensive odor that makes them unpopular around camps and cabins. This is more undesirable than their pilfering habits. House cats who do not know their wild country, and who have been transported to camp from the city, often tackle a wood-rat with dire results. The cat becomes violently sick and afterwards leaves wood-rats alone.

In his interesting book, *Our Small Native Animals, Their Habits and Care*, Robert Snedigar says of the pack rat:

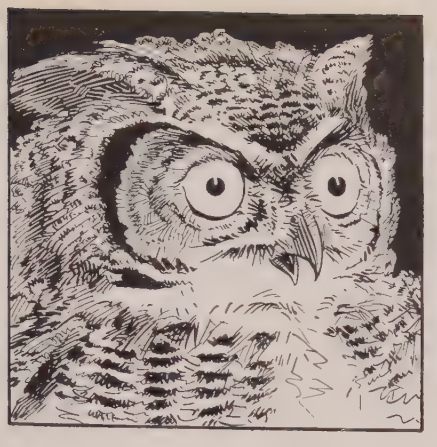
"There is little judgment exercised in the pack rat's treasure hunting. He does seem to have, however, an uncanny knowledge of what you can least afford to lose, and a perverted sense of humor in what he chooses to leave in its place. When my fountain pen disappeared from a cabin in the Coast Range, I could not feel that the ancient rabbit bone left was adequate pay. Later when part of my safety razor disappeared and a piece of twisted and dry cactus took its place, I decided to do a little trading myself and went on a tour of such nests as I could locate. Frequently, lost articles may be reclaimed by such hunts and, in this case, I was lucky. Unfortunately, with some species and localities, the nests are so large, so compact and bristling with cactus as to defy anything but wholehearted and reckless investigation."

On the care of pack rats in captivity, Mr. Snedigar says:

"As in other animals, individual temperament and species (as well as the tactics of the keeper) have a great deal to do with the behavior of wood or pack rats in captivity. Some will be found inquisitive and friendly; others wild and lacking in trust. All, ordinarily, adjust themselves to the rigors of cage life fairly well, and, if given room and dry quarters, an adequate food supply and reasonable freedom from disturbance until they are accustomed to their new home, pay their way in furnishing amusement and instruction."

Curiosity gets the better of the wood-rat and he comes closer to the camera with an excellent display of his really splendid whiskers. Above, Mrs. Whiskers poses coyly for a profile picture, crouched ready to flee, her large ears alert for the slightest sound that may indicate that it would be well to be away from there.

As We



See It

WHAT ABOUT THE WOODCOCK?

We are worried about the woodcock. This is not altogether a new experience, but in the year just passed we have had more cause to worry than in any for a long period. When, in the latter part of January 1940, the lakes and swamps of Mississippi, Alabama and Louisiana froze over, this bird was first in the thoughts of many. Old-timers recalled that the storm of February 12-14, 1899 (when three feet of snow fell in Washington, D. C.), caused the death of tens of thousands of woodcock from freezing and gun-slaughter in the South Carolina coast region. For these and other reasons, an official report from the Biological Survey on the effects of the freeze was awaited with interest.

The first news release on the species, dated June 24, 1940, proved disappointing. It did not refer in any way to the severe destruction in the South, but stressed mainly the difficulty of banding and studying this "mystery game bird" by "shrewd scientists," who hope eventually to learn "something about the life history." In view of the alarming status of the bird, this release seemed trivial and ill-advised. Apparently it did not receive the benefit of competent supervision.

Shortly afterwards (the leaflet is dated June, 1940), some details of woodcock mortality were given out. "During the winter months this species is heavily concentrated in the lower Mississippi Valley . . . probably as much as 75 per cent . . . fall flight was good . . . then came the abnormal weather conditions of January 1940 . . . these conditions could only prove disastrous . . . unfortunately, this occurred at the time of the open season in that State, January 1-31. As a result, in addition to untold numbers of birds that unquestionably died of starvation, hundreds were killed in bag limits by hunters . . . many sportsmen refrained from further shooting, but many others, disregarding the ethics of sportsmanship, continued day after day to shoot the weakened birds. . . . Very little of the killing was found to be illegal, although reports were received that the birds were being sold on the streets. May reports from . . . Pennsylvania and Maine . . . showed decreases of 40 and 37.5 per cent, respectively, under the populations of 1939." These figures were repeated on July 12.

Well, such conditions surely called for a closed season since they concern a species of great importance from both esthetic and scientific standpoints, one found only in our eastern states and provinces, the entire stock of which was almost cut in half. But all the bird got was a season reduced to about two weeks.

Despite its reputation as a "mystery" bird, a term bestowed on it by the gunners to cover their own ignorance, and one which has been repeated by many writers who know little more about it, the main facts of the life history and migration of the woodcock—at least enough to indicate the main steps necessary to save it from destruction—have long been known. Forbush, Brewster, Bent, and other observers too numerous to mention, intelligent and painstaking, have written many pages on its habits and movements. It has long been known, for instance, that the bulk of these birds breed in our northeastern states and the Maritime Provinces, and that they winter largely in the southern Mississippi Valley. There, since the days of Audubon, they have been subjected to the murderous sport of fire-lighting in which bag-limits have little part, and in a region where, until recently, game laws have been little respected.

For many years woodcock seasons in the various states and provinces have been so arranged that the birds could be shot legally through successive months from October 1 (sometimes September 1) to December 31, as they moved southward from the breeding range in our Northeast to the wintering grounds in Louisiana and Mississippi. But in 1938, and 1939-40, for some reason we do not understand, and which has not been explained, the customary shooting season in Louisiana—of all states—was shifted from December to January. This indulgence to Louisiana (Mississippi closed the season in these two years), extended the period of danger for the woodcocks native or transient in northern New York, Michigan, Minnesota, New Hampshire, and Vermont to four months. We will leave it to the lawyers to determine whether or not this action violates Article II of the Migratory Bird Convention,

which prescribes an open season of not more than three and one-half months.

Also, allowing the killing of the woodcock in Louisiana in January violates the spirit of laws forbidding spring shooting, for records of mating and egg-laying in that State are not infrequent in January, and even in December.

More than twenty years ago, as a result of an official inquiry as to the status of this endangered bird, an official of the Biological Survey—and one not especially zealous in bird protection—declared his belief that the woodcock should receive total protection for a term of years, but his recommendation was not acted on, nor has the bird ever been given such a respite. Sometimes we wonder if closed seasons as a conservation measure are not themselves being outlawed.

Edward A. McIlhenny, writing in *The Auk* for July, gives a rather circumstantial account of weather conditions in southern Louisiana in January, 1940, and their effect on the wintering birds. The quotation following gives the gist of his material on the woodcock: "On January 18, a slow rain which froze as it fell started about mid-day. This rain continued as a sleet all night, and well up to mid-day on the 19th, when the temperature had fallen to 14° F. This sleet covered the trees, plants and ground with a heavy coating of ice, causing the whole earth and foliage to be a glare of ice several inches in thickness. This ice continued . . . from the 19th through the 24th, without change. On the afternoon of the 24th, it began to melt on the foliage and in south and southwestern exposures along the timber; the ground continued frozen, however, for sixteen days, or until February 3. . . .

"On the nights of the 19th and 20th, woodcock (*Philohela minor*) came into the extreme southern part of Louisiana in unprecedented numbers. I have been a woodcock hunter for almost sixty years, and have never before seen such enormous numbers of these birds as came into the area extending from the coast to twenty-five miles inland. Woodcock literally swarmed in every bit of cover where they could find some protection from the wind—open woods, briar patches—wherever they could find some cover, they congregated.

"They got no protection from man, and were slaughtered by the tens of thousands, with sticks, .22 rifles, and shotguns. They were sold openly in the streets of the towns of southern Louisiana at from fifty cents to a dollar a dozen, but very few were taken by buyers on account of their being so thin. This condition existed until January 28. On January 25 I took a short walk with a friend, following the edges of the timbered section of Avery Island, and in a little less than one hour and a half, only walking along the southern and southwestern coves of the woods, where some of the ice had melted off the ground, we put up 1011 woodcock, without going over any of the territory twice. . . ."

How can any agency responsible for the preservation of a stricken species, and with such evidence of its dire need, believe that it can be brought back under shooting, even for a shortened season, over its entire range? If a bird is ever to be given a rest from the gun, surely the woodcock deserves that consideration now.

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Condemned

By ELIZABETH HALL IVEY

Majestic pine, with arms flung upward to a star-lit sky—
As if in praise or prayer—you needs must die
To satisfy a man's destructive urge. No reason more—
Only that you must die.
You take such little space on which to stand and grace the land.
Your tall straight body lifting ever-green bouquets,
When other trees are bare,
Reminder of those summer days so lately gone; and, during wintry snows,
God's promise of a coming spring. So little—yet so great a thing.

But you must die to give a broader space for garden place—
(Not needed by the man who owns the land). If hunger stalked *his* clan
You'd gladly die to feed a starving mouth—or glazing eye.
But even now he grows more than his need (and he's well fed)
But you . . . you'll soon be dead!
Oh, why this wanton waste of you who give so much of strength and beauty
In so small a space?

So quietly and modestly you climbed through forest-tangled earth
Where flowers bloomed, where brambles spread, and wild things
Brought to birth
Each after its own kind. We noted not your worth
Until you towered high to shelter feathered creatures from
Winter's storm-swept sky,
And needle-pointed carpet you gently wafted down to quiet forest echoes . . . temper sound.

But lo! the man has spoken . . . and you, our forest giant,
Which Nature, years a-building, fashioned her masterpiece,
Made strong, and yet so helpless.
Soon you'll lie bruised and broken, a dead thing on the ground.

PIRANHAS—MAN-EATING FISH OF THE AMAZON

These piscatorial bulldogs made quick work of a quarter of beef anchored in the stream to attract them for the purpose of a motion picture film

Concerning Crocodiles

Some recollections of Brazilian jungles

By ARTHUR H. FISHER

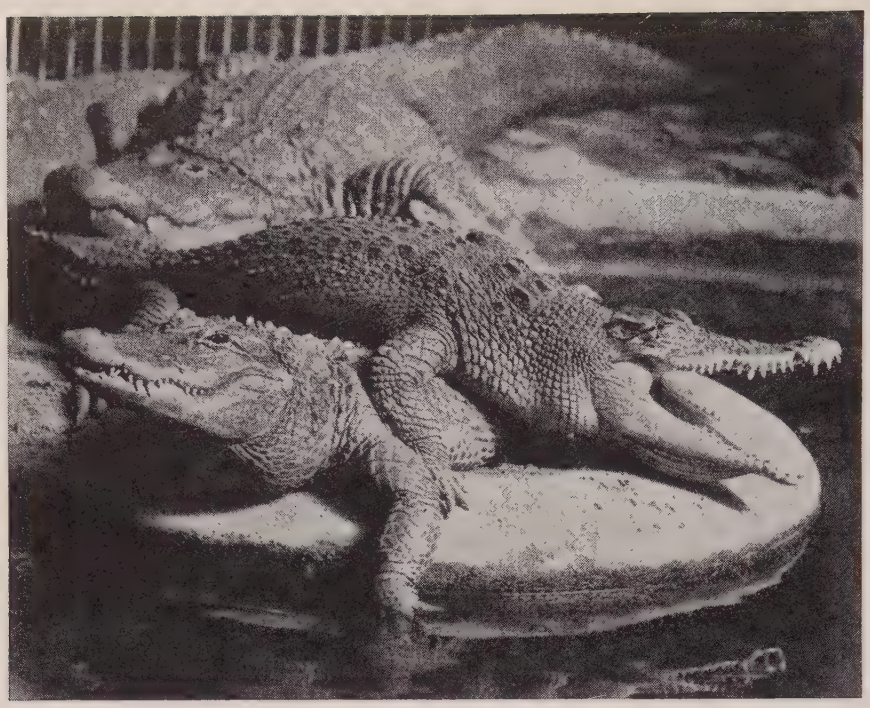
Photographs by the Author

NIGHT-HUNTING with flashlight and camera offers real adventure; a challenge to match wits with forest and jungle folk. The rewards are great to those who are successful. Unfortunately, to many the flare of a flash or the click of the shutter will never take the place of the roar of a gun or the bay of a hound. Pelts and not pictures are the goal of too many. However, night-hunting in the United States is as cruel and one-sided as a cockfight or the bullring, and is no longer within the category of true sport. Such innocuous "critters" as raccoons and opossums should be left alone in their none-too-easy battle for existence. Fortunately, the mere mention of night-hunting for deer has long ago become an anathema, and no one seems to find it difficult to control the urge to seek out a grizzly by the light of the moon.

If I have made my case, I now have two pardonable excuses for night-hunting to present, particularly for those gunners who have no fear of the hypodermic technique of mosquitoes or water-moccasins, and care to carry firearms afield after the sun has dipped below the rim of a tropical horizon. I offer crocodiles and alligators. They bellow loudly, their eyes burn red, and for them I have no love and make no plea. For some reason, not induced by fear, the whole order of Crocodilia has always appeared to me as somewhat like a bad dream—an unsavory relic from the age of reptiles, which now, like dictators, could well be left out of the present cosmic

GAVIAL OF BORNEO AND SUMATRA

This one grows to about twelve feet, although the gavials of northern India often attain thirty feet and are fearsome beasts



ALLIGATOR AND CROCODILE
In the background the alligator of this country, and, nearer, two specimens of the sharp-nosed crocodile that is a native of west Africa

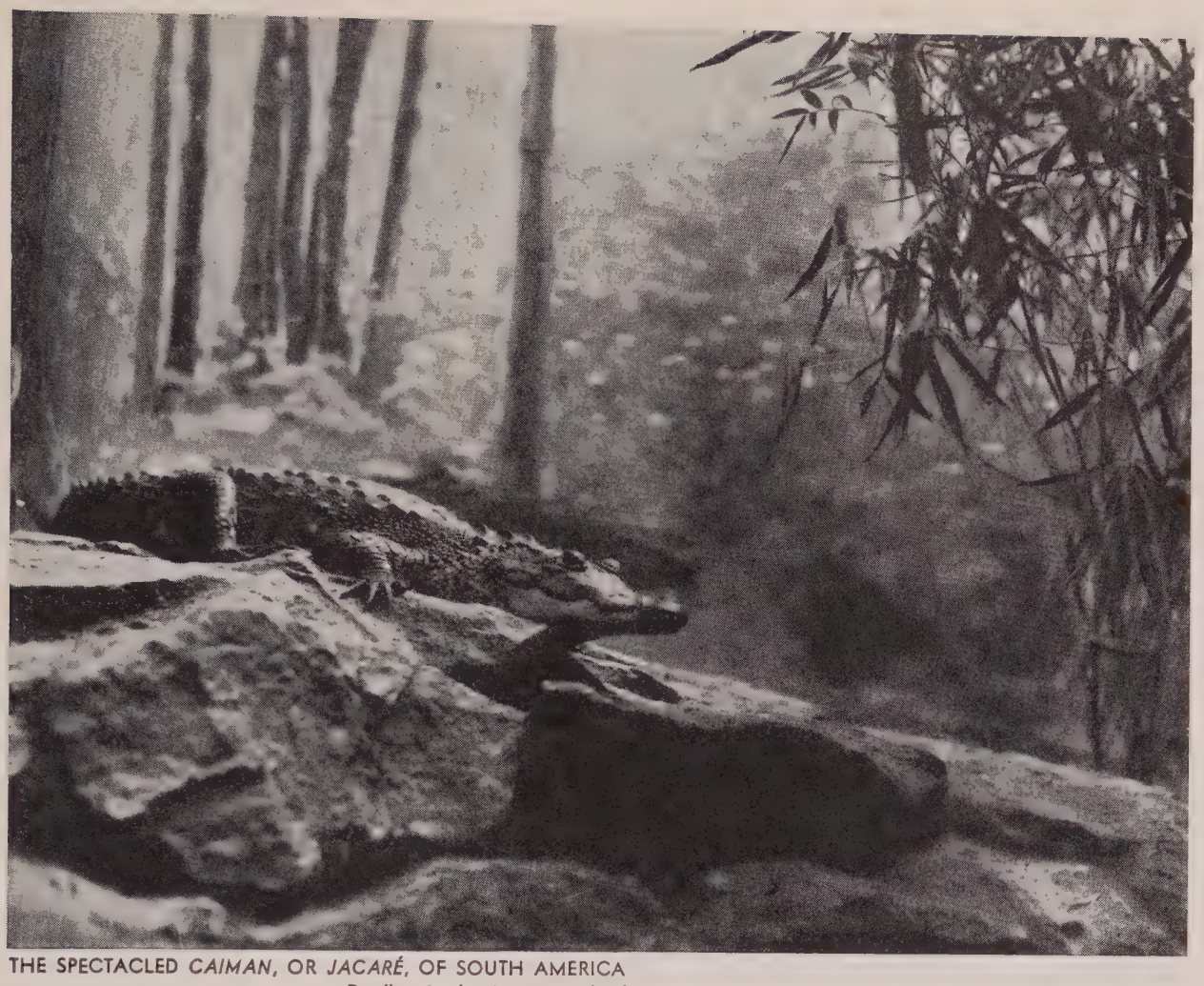
set-up. They may still fit in with a far-too-often disturbed balance, but I'm afraid I have a grudge that is of long standing and has grown with the years.

My first really intimate experience with their kind occurred many years ago in the Philadelphia Zoo, where I first attempted to describe animal life through the medium of photography. There, during the warm months, an exceptionally large Florida "gator" was confined in an outside enclosure through which ran a small creek. I had previously been close to several of this species in the South, and had always been told that they would not attack a man on land. In zoo-land, however, they must depart from natural behavior; this one certainly did. It was lying in the water between two sloping banks, and without benefit of keeper, I climbed the fence to make its portrait from a distance of about fifteen feet. I did not get the picture, but that alligator all but got me. The speed with which it reached the spot I vacated was amazing. I imagine my speed was not poor, for the alligator had no hurdle to make and its jaws snapped behind me like a gate. Both my camera and feelings were damaged. The former was repaired; the latter never have been. Naturally, since I have been making photographs of dangerous animals at close range for more than twenty-five years, I have had a few close calls with tigers, leopards, lions, bears, and such, but somehow they have always retained my regard and respect. They have always "played the game" according to their lights. On the other hand, for all "crocs" and "gators" I nurture an intense dislike, and I fear it had its inception that bright June day.

My next, and far more unpleasant experience with saurians took place several years later while I was on a photographic and archaeological expedition in northern Brazil. I was traveling on a small river boat on the Amazon, and went ashore at a small settlement to investigate the cause of considerable excitement among the natives. I found a group of hysterical women gathered around a child of about five whose leg was badly lacerated. It seemed that the little girl had been seized by a *caiman,* or *jacaré,* as these South American crocodiles are called in Brazil. She had been playing along the shore when the brute rushed from the water. A twelve-year-old sister, hearing the child's screams, had bravely run to its assistance, literally dragging her from the jaws of death. With no medical attention available, and infection almost certain, I could see little ahead for that child, except a painful death or the hapless life of a cripple.

Crocodiles in some form are found in practically every tropical and sub-tropical region of the globe, and in most of their habitats they are dangerous to man. In Australia, China, Malaysia, and in both India and Africa, they are notoriously bold, taking a heavy toll of life among the

THE SALT-WATER CROCODILE
Growing to about twenty feet, this savage crocodile is found in India, Malaysia and in the Solomon Islands and north Australia



THE SPECTACLED *CAIMAN*, OR *JACARÉ*, OF SOUTH AMERICA

Dwellers in the Amazon and other rivers of South America. Seeking them out at night provides an experience which is full of thrills and no small amount of danger

natives. Alligators are found only in our southern states, and in a single restricted area of China. They are still fairly abundant in several sections of our South, and unquestionably there have been some instances of their attacking and injuring human beings. However, to separate the facts from the fiction in a round-up of such data is no easy task. That they will defend themselves when attacked is well established, and hunting them at night is certainly more zestful than watching a raccoon make a helpless stand against a pack of trained killers.

All of the South American crocodiles, of which there are several species, are known by the name *caiman,* except in Brazil, where they are universally called *jacaré.* Here their numbers seem almost limitless, particularly in the Amazon Valley, where, strange to say, in comparison with other countries where crocodiles occur, the loss of life they cause is small. This is even more remarkable, when we consider that this great Amazon basin embraces nearly one tenth of the running water of the world, and that all its tributaries teem with many dangerous species. The largest, *Caiman niger* (*jacaré uassu* in the vernacular), is generally reputed to reach a length of twenty feet, and to be quite bold in the water. I saw several large ones of this species in the Rio Tapajos, and for that reason my ablutions in that beautiful river were carefully planned and usually aborted. I cannot imagine risking a more ignominious death. Only once did I ignore their possible presence, and dived into the river to escape the attentions of a few hundred fire ants, each a red-hot needle intent on engraving its individual monogram on my unprotected torso.

During the several months I spent in northern Brazil, it was in the delta region of the lower Amazon that I saw the most *jacaré.* There I encountered them in countless numbers, and while the temptation was ever before me, I considered it a stupid waste of ammunition to blaze away at them during the daylight hours. On the other hand, to seek the big ones out at night, and see their eyes shine scarlet under the gleam of a flash-lamp, had for me a definite appeal, both as a worth-while experience and as a novel way of acquiring the material for a Gladstone bag. It was while staying at a small outpost of one of the island's largest cattle *fazendas* that I found an exceptionally fine opportunity for *jacaré* night-hunting.

A short distance from this outpost, a small *igarapé* (Tupi for "canoe-path") known as the Rio Cajuuna, meandered through a swamp of lush arum growth. It continued on a serpentine course through almost impenetrable jungle where the banks were fringed with tall mangroves and thickets of bamboo. A journey through this

part of the stream disclosed vistas of unusual charm, the only disturbing feature being the numbers of ugly saurians that continually launched their grotesque bodies into the mirrored pictures of sunlight and shadow. I had twice made a reconnaissance of this stream, and realized it was an ideal abode for large *jacaré,* and although I had seen none, I was told that some truly big ones used this part of the *igarapé.* This was not hard to believe, since more than once I felt I had heard the deep throaty grunt of an old patriarch come from the stream, as I lay in my hammock enjoying the starry splendor of the long equatorial nights.

It was on such a night, as I watched the Southern Cross appear like a great diamond brooch set amid countless lesser gems and listened to the cadenzas of a frog choral society in competition with a philharmonic organization of orthopterous insects, that a false note was read into the score. Unmistakably it was the deep boom of an old bull saurian's voice. For some reason on that particular night, I resented this discord with almost childish petulance. Amid primitive surroundings my reactions were primitive. I coveted the offender's hide as an appeasement of my cumulative dislike for the entire order of Crocodilia. Then and there I resolved that either he or an equally large member of his clan must be silenced forever.

With the coming of the dawn my resolution was still firm. When I made it known, I received encouraging news —news that at the main *fazenda* there was a Negro who could simulate the call of a *jacaré* to a point of deceiving the most blasé old "croc" on the island; that his name was José; that he was indeed a "mighty hunter before the Lord". Being in the mood for adventure and not skepticism, I asked that he be summoned for an audition.

That afternoon he appeared, ebon in color, tall in stature and wide of grin. Remembering the technique of moose-calling, I rather suspected that he might use something equivalent to a birch-bark horn. Not José—he brought no accessories beyond a disarming smile as he stood waiting the word to open his bag of oral legerdemain.

We were in the open when he received his cue. Had we been inside the cabin, what might have happened to my ears or to the palm-thatched roof I cannot say. That husky nimrod let loose the most awe-inspiring bellow I have ever heard erupt from human lungs. By comparison, the best that Joe E. Brown of cinema fame has offered would be a whisper. It seemed to start at his feet and struggle upwards, at last to burst forth from an ivory-studded cavity of megaphonic size and intensity. It might be likened to the grunt of a titan porker equipped with amplifying tubes, falling off to something like the final staccatos of a lion's roar.

Although mildly suspicious that he had used high-pressure salesmanship, I was also completely sold. How any upstanding *jacaré* could ignore such an invitation or challenge I failed to see, whether it be a female seeking a mate or a belligerent bull. So José was engaged to be my coadjutor in all matters pertaining to the Crocodilia.

My new aide was quite deep in *jacaré* lore, and imparted much information regarding their nefarious and predatory ways, and as much as guaranteed that before the sun had again reached the zenith, a *jacaré grandé* would have done its last evil deed. And so that same day, just before midnight, we set out for the Rio Cajuuna, choosing the low tide, since uncovered banks are a great advantage in this sort of hunting. Crocodiles shot in deep water are seldom recovered. We found the canoe some ten or more feet above the water, making it necessary to do a "chute-the-chute" down the slimy ooze at an angle of about 35 degrees. I had experienced similar thrillers several times in daylight; once with a nasty upset when the canoe met up with a hidden log half way down the slide, and where the mud was of a consistency something near that of photographic paste. To extricate oneself from such a mess is no simple matter; to have it happen at night would be decidedly dangerous, since this particular *igarapé* swarmed with *piranhas,* those blood-thirsty little fishes that have been known to skeletonize a human victim in a few minutes. Only a few days before I had made motion pictures of these piscatorial bulldogs devouring a quarter of beef that I had anchored in the stream for that purpose, and later this night I witnessed these finny demons put on an exhibition of even greater and never-to-be-forgotten ferocity. However, there was only one way to launch the canoe so I sat in the bow directing the light down the slide, José sitting just behind me. Another boy, brought along to paddle, then gave a rock and a push as he leaped in astern, and down we went to a generous, bumpy splash, but a "happy landing". I then gave the flash-lamp to José, and with an 8 mm. Mauser across my knees, we started gingerly to make our way down stream. As soon as our eyes became accustomed to the feeble light of the starlit night we were able to dodge overhanging branches and keep the canoe free of the muddy banks.

It was eerie traveling, the stillness almost unbroken save by the weird cries of the goatsuckers flying overhead, or the splash of some nocturnal creature dropping or diving into the water as we approached or passed by. Once in a deep mass of black I saw two large orbs emitting a bluish glow; then they disappeared without a sound. José whispered *"viado,"* which is a small and beautiful species of deer. It was uncanny, but then tropical jungles are that way at night. I hoped that we might come upon the greenish gleam of a jaguar's eyes, as a colt had been killed by one the day before only a short distance from the outpost, but no such eyes were to show up that night. However, on such a night on such a stream it was hard to tell what each stroke of the paddle might bring forth.

As we continued slowly along, I began to wonder when my guide expected to prove the efficacy of his God-given gift of crocodilian oratory. Then suddenly and without warning it came, and although it came past my ear with less than half the force of his tryout effort, cold shivers tingled down my spine. It was almost as though a big *jacaré* had suddenly crawled in beside me. Then all was still, and I waited for the (Continued on page 173)

Conservation Comment

Since it involves a dangerous precedent, we regret to report that 3052 acres of a tract in the southeast corner of Hawaii National Park have been transferred from the Department of the Interior to the War Department to be used as bombing target range. This is only a part of the area originally sought, and is not expected to be as destructive to park values as it would have been otherwise, but the inviolability of our National Parks has been affected, nevertheless. Such a policy strengthens the hand of those supporting such measures as that proposed in the closing weeks of the 76th Congress—and, probably, to be reintroduced in the 77th Congress—authorizing the transfer of National Park areas for "emergency" purposes. We do not regard such general legislation as necessary.

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Closing a successful year in conservation work and public education in this important activity, the Texas Nature Federation looks forward to the new year as a challenge to even greater effort. Jerry E. Stillwell, secretary, in his annual report, urges a State Conservation Council to coordinate all activities affecting natural resources, and adds: "In view of the unsettled economic condition, the European war, and other factors, it will be necessary for interested and loyal conservationists to be especially vigilant in protecting wildlife during this period."

• • •

One activity of the Roosevelt Administration that appears to have had virtually unanimous support has been the creation and continuance of the Civilian Conservation Corps. There has been little criticism of its conduct and accomplishment. We have felt now and then that some of the specific projects undertaken were not truly conservation—often were really destructive of values—but this has been more a reflection of questionable policy of the agency under whose control the work was conceived and carried out. There has been a tendency to believe that the social significance of the CCC was most important and that the conservation contribution might be assumed to be both satisfactory and great. This first phase of the Corps' objectives is given careful consideration in a report and recommendations by the American Youth Commission of the American Council on Education. The study was made from the viewpoint that "the central purpose of the CCC should be that of improving health, skill, and efficiency of the boys enrolled, to help them become useful and successful citizens in whatever occupation they may afterwards enter." The conclusions reached from this point of view are important and the recommendations merit attention. We wish that a similarly competent and fair estimate might be made of the actual constructive work of the CCC. Such a study would be historically valuable, and might indicate how the work might better be carried on in the future.

• • •

We note that the Indiana Department of Conservation is sponsoring its eighth annual crow shooting competition among sportsmen's clubs with prizes for the most crow feet obtained. This is known as the "Crow Control Contest", thus giving it a sort of scientific standing which, of course, it does not have. Where control of crows is necessary—as occasionally it is—it should be proved to be so by proper scientific investigation. The sportsman seeking something to shoot at is no scientist.

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Final barrier to the construction of the 480-mile highway connecting Great Smoky Mountains and Shenandoah National Parks has been surmounted by the signing of an agreement with the Cherokee Indians in North Carolina, across whose reservation the highway will pass. This ends a five-year-old controversy.

• • •

Reports from the 1940 deer hunt on the Kaibab National Forest in Arizona are interpreted to indicate that the wildlife management plan adopted in recent years has resulted in bigger and better deer on a better range. Long cited as an example of what overpopulation will do to both animals and food, the policy of harvesting a part of the crop during a twelve-day season and under careful restrictions seems to be justified. Both does and bucks were shot to fit the numbers to the capacity of the range, but only 38 percent of the animals taken were does.

• • •

Once a refuge for pirates and rum runners, Bulls Island off the coast of South Carolina is now being rediscovered by tourists. It is a part of the Cape Romain National Wildlife Refuge, a 60,000-acre reserve with headquarters at McClellansville, South Carolina. The island, rich in both flora and wildlife, promises to become a vacation goal of outdoor-minded folk.

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At his sanctuary in Kingsville, Ontario, Canada, Jack Miner has banded more than 50,000 ducks since 1909, and more than 23,000 Canada geese since 1915. In checking the returned bands from dead ducks he finds that ninety percent of the birds were shot east of the Mississippi River. Only six of the six thousand geese bands returned were from west of the Mississippi. Jack Miner points to this record as conclusive evidence that the ducks and geese that breed in northern Ontario, and at Hudson and James Bays, hold to an eastern flight lane between the Mississippi and the Atlantic Coast.

BEHIND THE SEED PACKET

By ANDREW S. WING

Garden Editor, Nature Magazine

"WHAT'S so interesting about a packet of garden seeds?" someone may ask. "The seedsman grows the seeds, puts them in an envelope and sells them. Why get excited about such a simple thing as a packet of seeds?"

It is not so simple if you know the facts. When you get behind the scenes, when you really know the inside story of a packet of garden seeds, you not only find a very exacting business, but a rather exciting record of one of our oldest industries. Yet it is also one that is ever new, ever changing. In it are large firms and small ones, some of which have been in the business for many generations. They are scattered over the civilized world. In this most specialized industry many firms have grown large. Few men, however, have become rich by selling the seeds that we sow in our gardens each spring.

To go back to the beginning one would find himself lost in the distant haze of early history. Perhaps a good place to begin would be at the old walled medieval city of Erfurt, Germany. For it was there, the record tells us, that a group of growers started the first market gardens in the world, in the sense that we know them today. In little patches of fertile, spring-watered land outside the stone walls of Erfurt, short, sturdy German peasants plowed, sowed, and hoed, producing beans, cabbages, turnips, and a few gay flowers, which they sold in the market place within the town. These enterprising fellows became prosperous, and other gardeners imitated them. These others had to have seeds, too, so they came to the Erfurt gardeners with willing purses to buy them. And so Erfurt became one of the first seed-producing regions in the world. Even today Erfurt is known as the Flower City of Germany—that is, we assume that this is still so.

DAVID BURPEE INSPECTS HIS SEED PLANTS

These are blooms of the Blanche Burpee forget-me-not, named by him in honor of his mother. They are of mixed colors

But to get back to our packet of seed. Suppose it is a packet of petunia seed. We open it up and pour it into our hand. It is almost like powder, it is so fine. There are enough seeds in a packet to grow perhaps 1000 plants. Who grew this seed? Was it the man whose name is on the packet? Where was it grown? Who originated this particular variety, and how? All these questions lead us into interesting bypaths. We might start with a little seed-breeding farm in Japan, where a kimono-clad gardener carefully hybridizes, selects and grows the pedigreed plants. From there we might follow the original strain to California, or even to England, where a great seed house tries it out in its own garden or greenhouse along with hundreds of other petunias from all over the world.

Satisfied that it is a good strain, the California grower, let us say, obtains more seed from the original source and propagates it

SEED CROPS ON THE FERRY-MORSE RANCH

This is located at San Juan Bautista, California. California now grows seventy-five percent of the United States' supply of seeds; fifty percent of the world's supply

ZINNIAS GALORE ON HUNDREDS OF ACRES

This is a planting for seed purposes on the Burpee Floradale Farms in California. There are some five hundred acres of seed zinnias on the various seed farms in the favored Golden State

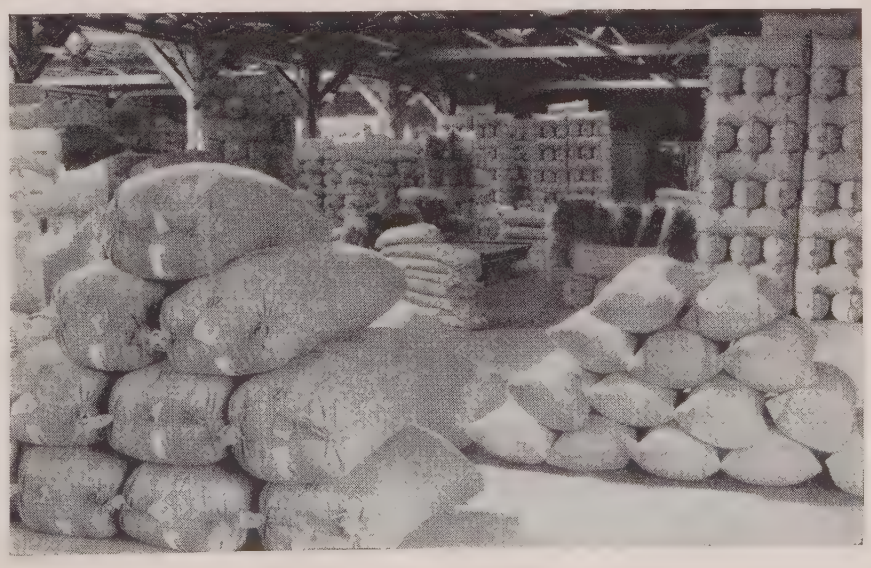
in a huge field in one of the sun-burnished valleys. From the resulting stock, new selections are made, sports crop out, or hybridizations are made by bees or by hand, and in the course of a few years we have a strain that is even finer and hardier than the original. At first the seed is very dear—only a pinch for twenty-five cents, but finally, when it becomes more plentiful, fifteen cents will buy a packet of perhaps 1000 seeds.

There are men and women who spend their lives traveling around the world in search of new plants, and new varieties of old ones. I have known a number of these people. They are an interesting lot, mostly quiet, unassuming persons who look little like adventurers. Yet if it were not for them and their zest for travel, often exposed to discomforts and sometimes to dangers, and their zeal as plant hunters, our gardens would be barren of some of the most beautiful things we grow. One of these is John C. Bodger, head of the great seed firm that bears his name. Have you ever heard of John Bodger, or his equally famous daughter, Elizabeth Bodger? Perhaps you have not, but their discoveries and originations are known to gardeners everywhere. You have probably heard of Orange Flare cosmos, Golden Gleam and Scarlet Gleam nasturtiums, Fantasy Wildfire zinnias, and many of their other introductions, including 104 recent varieties of wilt-resistant asters.

Why have you not heard of the Bodgers? Because they are wholesale growers, widely known within the trade, but shunning publicity among consumers. At their farms at El Monte and Lompoc, California, they grow 200,000 pounds of flower seed a year, enough to plant a bright border around the world, if there were enough dry land. The Bodgers grow only flower seed, which they sell at from ten cents a pound for sunflowers to $200 an ounce for double-ruffled petunias. While John Bodger is the scout and salesman, traveling thousands of miles every year, his daughter Elizabeth is even more famous as a hybridizer. It takes both kinds of talent to make successful seedsmen.

But to go back to our packet of seed. Let us say it is a ten-cent packet of White Icicle radish, an old standard variety of which I am fond. Suppose, for example, this seed is worth sixty-four cents a pound wholesale. If our seed packet contains a quarter ounce, that makes sixty-four packets to a pound, or $6.40 retail—a dollar for every ten cents invested in radish seed. Even if the packet sells for only five cents, it looks like a big profit. Why, then, do not seedsmen get rich quick?

Let us take another peek behind the scenes. There are, of course, expenses, as in every other business, for storage, insurance, interest, postage, freight, labor and overhead. The paper packets cost something, and there have to be special machines to packet the seeds and people to tend these machines. There must be a lot of people in the office to answer letters, mail catalogs, and all that. Our seedsman spends a good deal of money advertising to get new customers, and his catalogs cost a pretty penny.



ACRES OF FUTURE FOOD AND BEAUTY ARE READY

A part of the Ferry-Morse Company's warehouse. Compared with the old seed companies in Europe, the industry in California is in its infancy, but it has come a long way in a relatively short lifetime

ACRES ARE DEVOTED TO THE EXPERIMENTAL WORK

The development of new species through the intricate and fascinating devices of the hybridists is carried on here to increase the gardening rewards

One of the big houses mails out 3,000,000 of them a year!

Then the seedsman has to packet more seed than he sells, especially those who sell through display boxes in retail stores. One big house has more than 100,000 of these retail outlets. The seed that comes back, or is left over in the warehouse, must be tested, perhaps several times, before it can be sold next season. Some seeds keep alive a long time, especially the plumper ones such as beans, clover, corn, and such. Others, such as parsnips and onions, are notoriously bad—alive today, dead tomorrow. Even if federal seed laws did not require caution, good seedsmen are scrupulously careful about selling only high-germination seeds, for the surest way to lose customers is to send out seeds that will not sprout. To germinate several thousand different lots of seed once or twice a year costs money.

Then gardeners are peculiar about varieties, especially in vegetables. They cling to old, out-moded varieties just because their grandmothers used to grow them, or because they liked them when they were boys back on the farm in Indiana. Every retail seedsman must stock up on these old, obsolete sorts—many of them distinctly inferior to improved varieties—or lose customers.

But before we shed too many tears for the seedsman, who really does not ask for sympathy, let us get away from some of these routine matters and out into the field again. All the larger houses have trial grounds where every lot of seed sold is tested for purity and quality against competitors' strains. Here, too, the novelties are tested, such as the All-America entries and selections. Nearly all of the leading houses do breeding work of some kind, even if it is only to develop improved strains of existing varieties. It requires a high grade of intelligence and skill, plus a knowledge of existing varieties, to check plants on trial, and if our seedsman has not time to do this work himself, he must have it done by competent helpers. Many seed-farms have trained geneticists on their payrolls. The larger firms have two or more breeding, testing and growing stations, usually one in the East or Middle West, and another in California. These are usually manned by separate staffs, and these farms must be visited several times a year. On these great seed-breeding farms all kinds of specialized machinery is used, from Diesel tractors to seed-harvesting and cleaning equipment. Here there are warehouses, greenhouses, and thousands of dollars' worth of tools and equipment, some of which can be used only a few times each season.

Many of the good varieties of vegetables and field crops, such as blight-resistant tomatoes and melons, hybrid sweet corns, edible soy beans, and the like, have been developed or introduced into this country by skilled workers of the U. S. Department of Agriculture, the state experiment stations and agricultural colleges. Plant breeders, in the past twenty-five years, have revolutionized the seed business by making it possible scientifically to create desired or needed varieties. They have even streamlined the cucumber, the squash and the watermelon; de-odorized the marigold; and tried to make the onion milder. But Nature still vies with (Continued on page 169)

SEED HARVESTING

Here cabbage seed is being gathered on the Ferry-Morse seed-breeding acres at Rochester, Michigan. Supplying seed that will produce plants to feed millions certainly constitutes a basic industry

PHOTOGRAPH BY DEWEY ALBINSON

IN BUILDING THIS NEST CHIMNEY SWIFTS DEPARTED FROM THE USUAL

It was found in a two-story wooden shack, in a small room on the second floor. Also the swifts had scattered the nest down the wall, providing what looks like a miniature stairway

A NEST WITH "STEPS"

By SAMUEL A. HARPER

WHEREVER it is built and of whatever materials, the nest of a bird is always an object of interest. With the endless variety of nesting sites and building materials, and the remarkable skill in construction exhibited by many of the birds, the study of nests almost equals in interest the study of the birds themselves.

Seldom does an individual bird of any species show much originality, however, either as to the site or structure of its nest. These characteristics are generally uniform throughout the species. If it is a tree-nesting species, few eccentric individuals will be found nesting on the ground. If sticks constitute the traditional nesting material, few nests will be found made of grass or feathers.

Some of our birds choose unusual nesting sites, but these also are controlled, with few exceptions, by the same persistence of instinct. They seldom depart widely from the habits of their race.

The chimney swift, one of the most interesting of our birds, has adopted an unusual nesting site—the inside of chimneys. Before the coming of man and his chimneys the swift glued her nest of sticks to the inside of a hollow tree. Audubon records the finding of such nests. But when the white men came to America the swifts took an immediate liking to chimneys and promptly adopted them as their favorite nesting sites, and since that time they have used them almost exclusively.

The dead twigs used in nest building are gathered on the wing. Several times, when I have been loafing on some sunny hill or in some shady ravine, I have seen a swift dart up to a dead tree top, flutter against the terminal branches and carry off a twig for its nest. The first time I observed this interesting performance I was lying on the green bank of a winding creek at the edge of the woods. A swift zoomed by, and as I followed its flight I saw it dart swiftly up to the dead top of a tree and suddenly "put on the brakes", just as perching birds do before they alight. I was startled by the thought that the swift was about to break the rules of its (Continued on page 171)

ELBERTA CLARK WALKER MEMORIAL POEMS

In 1925 Robert Sparks Walker, Tennessee naturalist, writer and poet, established the Elberta Clark Walker Memorial Nature Poetry Contest in memory of his wife. The Chattanooga Writer's Club, of which Mr. Walker is a member, assumed the responsibility of conducting the contest, judging the entries and making the awards.

In the 1940 contest more than eight hundred poems were submitted. First prize went to Pauline Starkweather, Seattle, Washington, for "Mother of Months"; second prize went to Rudolph N. Hill, Wewoka, Oklahoma, for "A Mountain Minstrelsy"; third prize to Lillian Savoie Hahn, Hope, North Dakota, for "Night without Stars." For the third successive year NATURE MAGAZINE is pleased to cooperate with the Chattanooga Writer's Club by publishing the winning poems. An anthology of past poems has been published by Mathis, Van Nort, Dallas, Texas.

Mother of Months

(Gloss on a Quatrain from Swinburne's "Atalanta in Calydon")

By PAULINE STARKWEATHER

When the hounds of spring are on winter's traces,
The Mother of Months in meadow or plain
Fills the shadows and windy places
With lisp of leaves and ripple of rain.

The garments of winter are old and falling
From the trees that border the little street,
Where yesterday howling winds were calling
To frosty goblins, and galloping sleet,
And the hail that danced on its icy feet.
All of the gutters are running races—
And so are the children out to play,
As gay and as eager to run as they;
For there's joy in their hearts; there are smiles on their faces,
When the hounds of spring are on winter's traces.

Gaunt are the poplars against the sky,
Gaunt and black, and the branches are bare;
But every zephyr that scampers by
Whispers a message to do and dare,
And the little buds are listening there.
The sap is finding its way again
From the waking roots to the highest bough,
And everywhere there is stirring now;
Not a living thing would dare detain
The Mother of Months in meadow or plain.

She arouses the little furry creatures,
Turning them out from their cozy beds,
And showing them all the familiar features
Of woods and river; she taps the heads
Of the sleeping crocuses; paints the reds
And the golden browns of the lovely laces—
The ruches and ruffles that hedges wear—
And then she dashes away to where
The reluctant cold in final bases
Fills the shadows and windy places;

And, oh, it is easy to put him to rout
When the geese are sailing like little boats
On the lake, and the pussy willows are out!
She sees that the pussies are snug in their coats—
Little gray coats fastened up to their throats—
And then rushes on like a hurricane.
How busy you are in the spring of the year,
Mother of Months, and how precious, how dear,
Scurrying over your vast domain
With lisp of leaves and ripple of rain!

A Mountain Minstrelsy

By RUDOLPH N. HILL

I

Buckskin-shirted hunter, I,
On the trail of backwoods days,
Footprints that yet hold deep
In wagon-rutted ways;
Let me wind a blast
On the old sheep's horn
When all the stars are still,
A brave, high blast in the violet morn
When the stars are white and still!
A blast as of fox and hounds gone past
On the pure air, clear and chill,
A deep, high blast re-echoed long
From the pine-green, silent hill.

II

Just at the edge of the little wood
Many a decade the cabin stood,
Lonesomely mated with solitude.

Trackless dust is thick on the floor,
A rusty chain holds the sagging door,
And locks all the memoried years before.

Silence dreams with the shakes on the roof,
Silence and darkness are shadow-proof
Inside, where log-walls stand aloof.

Only the wind, the wind and the rain
Patter the roof, and rattle the chain;
Seeking an entrance—always in vain.

Webs of the spider, woven so well,
Create by daylight a soft moon-spell,
Light as the substance of song of a shell.

Sung out of darkness from rafter and wall
Across the dim corners where moon-rays fall,
Matching the whip-poor-will's night-lorn call.

Flowers and weeds in the summer-time,
And the tall pines nod in their lordly prime,
Making a pattern of checkered rhyme. . . .

Rhyme of life's stream-song: darkness and light,
Rhyme of the dogwood's bridal with night;
Rhyme of life's sorrows and age-futile plight.

Rhyme of the square-dance, fiddle and bow,
Rhyme of the cradle, we reap what we sow;
Rhyme voiced of Nature, back to Nature we go. . . .

Echoless voices, ever unknown,
Haunt the old cabin dreaming alone,
Even as flower-scent evermore blown.

Echoless voices once dwelling there,
Eloquent of the souls that dare,
Find a reply in sunlight and air.

III

Buckskin-shirted hunter, I,
Though weak my blast,
Re-echoed from the hill.
And yet, these things are with me still:
A frail, frail verse,
A flower and glint of wings,
A star above a friendly pine,
And wind that sings . . . and sings!

•

Night Without Stars

By LILLIAN SAVOIE HAHN

O starless night and a fire on the prairie burning
under the open sky,
where the herder watches his sheep, and the wind in the grasses
tells old tales to itself
as it passes by!

Only the scent of sage and the embers glowing,
and the shine of animal eyes
in the velvet dark,
ripple this space and calm that the god of the plains created—
these, and the urgency
of the sheep-dog's bark.
Over the brooding mesa wrapped in its primal dreaming,
nimbus are hanging low:
tomorrow the rains may come, bearing life to the rangelands,
following after the winds
wherever they blow.
There is no watcher-moon to span the sky with her pacing,
measuring the fleeting hours
by the glow of her waning light:
there is but depth and void, and the benediction of darkness;
the fire, the sky, and the earth;
the man, the beasts,
and the night.
Here where living is stripped to the blood and bone of creation,
beauty is found
kindred to that of the ponderous planets moving
over their tracks in space
in ordered round.

O starless night and a fire on the prairie burning
under the open sky,
where the herder watches his sheep, and the wind in the grasses
whispers tales to itself
as it passes by!
. . . O starless night! . . .

•

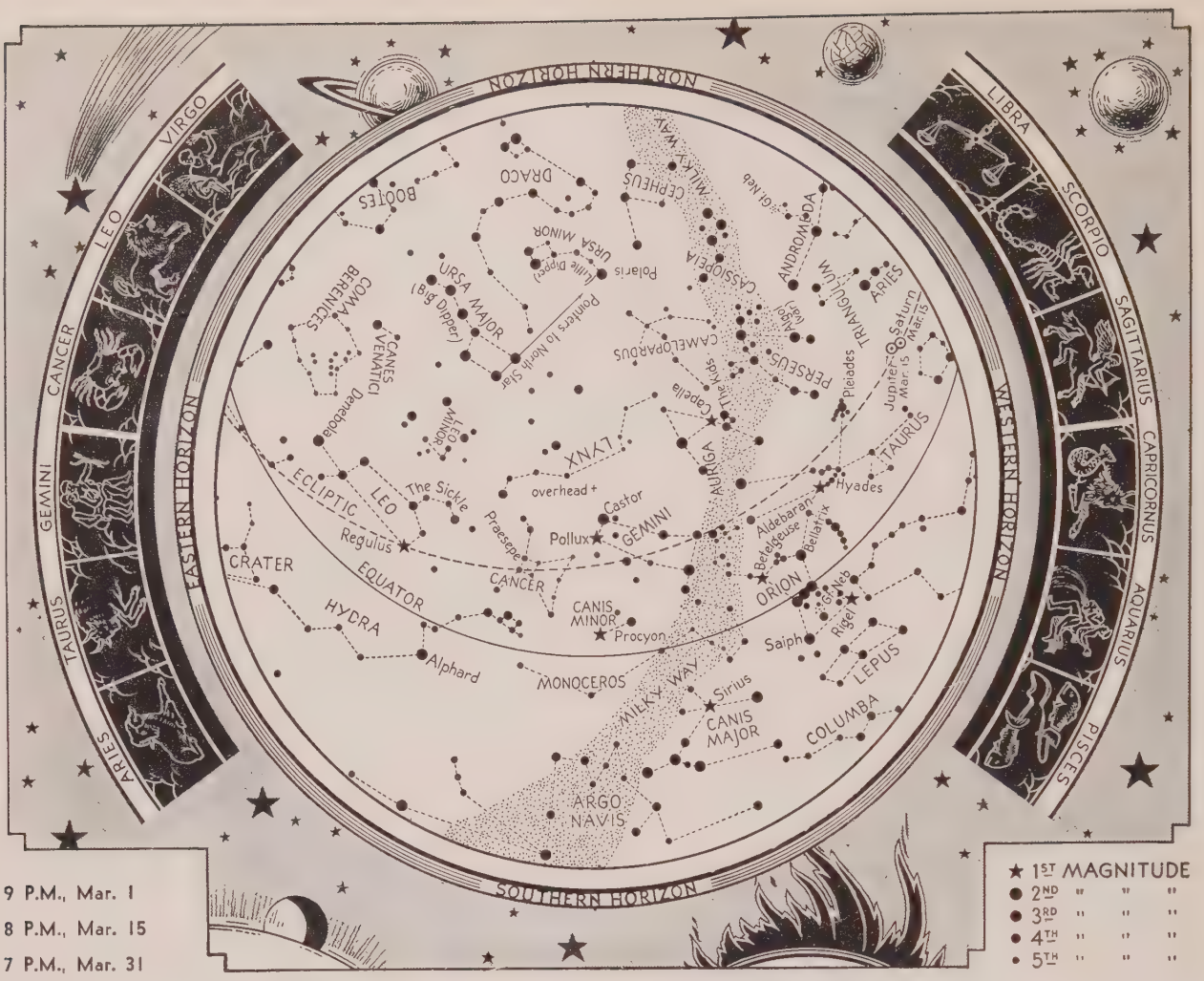
"I WANNA WORM"

By BRUCE COLE

SHOWING no signs of timidity, the baby rose-breasted grosbeak on his first trip from the nest was remarkably willing to pose for the photographer. In fact it was so eager that it required nearly half an hour to get the picture.

The bird acted as though it was submitting to a movie test and action was called for, because each time the camera was focussed and ready it would let out a lusty "cheep" and hop closer. Several out-of-focus shots were made, as well as others that showed the bird in the middle of one of its many hops, but patience eventually was rewarded.

This grosbeak's twin brother eyed the proceedings from a safe distance, but no amount of coaxing would induce him to enter the picture. He did plenty of hopping, also, but all of it was away from rather than toward the camera. Whenever the photographer would approach he'd retreat, and patience failed to produce results with him.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

ORION IN THE WEST

By ISABEL M. LEWIS

If one does not know one star or constellation from another, except possibly the Big Dipper, which almost everyone does know by sight, there is no better time of the year than spring to get acquainted with some of the finest of them all.

Next to the Big Dipper, Orion is the best-known constellation in the heavens. When we consider the world as a whole, the southern as well as the northern hemisphere, it is better known than the Dipper because at the equator it passes directly overhead and is seen equally well in both hemispheres. This is not true of course of the Big Dipper, which never appears above the horizon in forty degrees south latitude. To me Orion never looks better than when coming over into the western sky in the evening hours of early spring, with his two dogs close on his heels. What a magnificent group they make! On midwinter nights they seem to shine coldly and distantly in the eastern half of the sky. Often one gazes at them hurriedly and hastens in to the warmth of the fire, but in spring one is more apt to linger awhile under the mild springtime sky and admire the splendor of this group, which is unequalled in the heavens.

If you do not know Orion at all he is best recognized by those three stars in his belt, which is so straight and so evenly studded with its brilliant gems. The red giant star, Betelgeuze, is in his right shoulder, and in the opposite corner of the great four-sided figure that outlines his body is Rigel, brilliant blue-white and one of the hottest stars in the heavens. This star lies in the left foot. The chart will help one identify the other principal stars. That little group of three faint stars northwest of Betelgeuze are in the head or Orion, and below the belt in the center of a line of faint stars that outline the Sword of Orion is one of the most beautiful objects in the heavens, the Great Orion Nebula. This can be seen as a patch of faint light even without a telescope. Seen even with a moderate-

sized telescope it is a magnificent object in the heavens.

In the brightest part of the nebula is the star Theta, which is called a sextuple star because it is really made up of six stars. Four of these may be seen easily in small telescopes and they look like tiny, brilliant jewels embedded in the heart of this beautiful nebula. So enormous is this nebula that faint extensions of it envelope the entire constellation. There is also a remarkable dark nebula in Orion that, outlined against a background of bright nebulosity, resembles nothing so much as the head of a horse. It is for this reason called the Horsehead Nebula. According to a legend told by the ancients Orion was once stung by The Scorpion, which is represented by the constellation of Scorpio, seen in the summer skies. He was so terrified by the experience that he now flees from the western sky as Scorpio appears on the southeastern horizon. One may, indeed, see fiery Antares in the heart of Scorpio just coming into view in the southeast in the early evening of the month of May while Betelgeuze, the last of the Orion stars, shines on the western horizon.

Until that time approaches we may continue to admire this magnificent constellation in our western sky with his accompanying Dog Stars, Sirius and Procyon. The last of the group to disappear below the western horizon will be the Little Dog Star, Procyon, which is so much farther north than Sirius that it remains in view much longer. These two brilliant stars make a huge triangle with Betelgeuze. One easily can find Sirius because it lies in line with the three stars in the belt of Orion. But one does not need this aid in finding Sirius, for it is the brightest star in the heavens. One should remember, however, that the planets Venus and Jupiter, and sometimes Mars, do outshine it. Sirius also has a strange faint companion star—visible only in the most powerful telescopes—that is known as a white dwarf. The peculiar fact about these dwarf stars is that they are enormously heavy for their size. A cupful of the substance of which the companion of Sirius is made would weigh several tons, and some of the white dwarfs are still heavier.

One who is getting acquainted with the constellations for the first time needs to bear in mind that when Orion disappears from view in the evening twilight in May he will not appear in the evening sky again until early in November; and then will be seen far over on the eastern horizon late in the evening. If one should rise in the morning twilight in August, though, his familiar and friendly stars will then greet him.

An interesting little group of stars that lies just below the feet of Orion, and which we mention because it is so easy to identify if we are studying the constellation of Orion now, is Lepus, The Hare. There are four stars of third magnitude in it in the shape of a little four-sided figure. It is south of Rigel and west of Sirius.

For more than two months now we will have the opportunity to study not only the stars and constellations of spring as they rise one by one in the east, but also the departing stars of winter. Not only Orion and Canis Major and Canis Minor are now well in view in the west, but also the Pleiades and Hyades in Taurus, and Auriga and Gemini. The friendly pair, Castor and Pollux in Gemini, are nearly due north of Procyon. We must make the most of our opportunity to get acquainted with these two stars now if we are to know them, for the sun will be in this constellation at the beginning of summer when it is farthest north. It will be lost to view in the evening twilight by the first of June. Auriga, with its beautiful Capella and The Kids, will remain in view a few weeks longer in the northwest. Leo is now high in the eastern sky in March, forerunner of the spring constellations. Cancer, the Crab, a spring constellation, between The Sickle in Leo and Castor and Pollux, is also in view high overhead at this time. It lies in the zodiac along with Taurus, Gemini, and Leo, but is hard to find because it has no conspicuous stars. We locate it best by its position between Gemini and Leo.

The sun is now in the constellation of Pisces, next to Aries on the west. Spring will begin in the northern hemisphere, and autumn in the southern hemisphere, as it crosses the equator on its northward journey on March 20 at 7:21 P.M. Eastern Time. Day and night will then be equal in length all over the world.

There will be two eclipses this month, a partial eclipse of the moon on March 13, and an annular eclipse of the sun on March 27. The magnitude of the partial eclipse of the moon will be 33 percent and it will be seen over all of North America except the extreme northeastern part. The moon will enter the shadow of the earth on March 13 at 5:55 A.M. Eastern Time. The middle of the eclipse will occur at 6:55 A.M. and the moon will leave the earth's shadow at 7:56 A.M. In the eastern part of the country the moon will set partially eclipsed at sunrise before the magnitude of mid-eclipse has been attained. In the Western States all of the eclipse will occur with the moon above the horizon. This eclipse will also be visible in the western part of South America, the Pacific Ocean, Australia, and eastern Asia.

The annular eclipse of the sun of March 27, in which a thin ring or annulus of light will be seen surrounding the moon at greatest eclipse will be invisible in the United States and Canada, but partial phases of the eclipse will be visible as far north as central America. It will be seen over nearly all of South America, and the south Pacific. The path of the annular eclipse will cross the south Pacific to Peru. Lima will be within it. It will leave the earth at sunset in the central part of South America, in latitude about twelve and one-half degrees south.

Among the planets this month Jupiter and Saturn are still close together in the evening sky in Aries. Jupiter is by far the more brilliant of the two planets and a deep yellow in color. Saturn is pale yellow and lies a few degrees to the southwest of Jupiter. Mercury, Venus and Mars are all in the morning sky this month. Venus is now drawing very close to the sun in the morning twilight and is in conjunction with Mercury on March 3. Mercury will be at elongation farthest west of the sun on March 25 but will be difficult to see as it rises only an hour before the sun. Mars now rises about three hours before the sun and is slowly increasing in brightness.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Time and Space

We hear much from those who plan Nature and Science programs for school about developing the idea that space is vast and time is great. No one will argue that these statements are not correct, but we can raise the question as to whether our school offerings should begin with these ideas.

A mid-West program in agriculture begins with the study of the electric eel at the lowest grade levels. An eastern city begins bird study in the lower elementary grades with the study of *Archaeopteryx*. I myself began my high school teaching experience with a lesson to young Iowa farmers on the differences between oospores, zoospores and zygospores. There are logical reasons—and a few psychological ones—that might justify these procedures, but they are few and far between. Within the last week, I had occasion to work with some fourth-grade youngsters who could give a figure that they thought represented the diameter of the sun and another that represented the distance between the earth and the moon. They did not know near what horizon they would see an evening full moon, nor had they ever noticed that the snow was melted wholly from the roadside banks that faced south, but not at all from the opposite banks that faced north, even though this road was the one over which they came to school every day.

Would it not be more sensible to study the snowbanks that are in so many school yards than to study atmospheric conditions on the moon? I know of any number of texts and outlines that suggest the study of what would go on on the moon if you were there and could talk—assuming that you could live there long enough to talk—but I have yet to see a single text or outline suggesting the study of a snowbank.

I like the snowbank. I can make it form where I want it to. I can carve down through its sedimentary deposits. I can see lessons on erosion in it. I can metamorphose the crystals of which it is composed. I can explore its light and heat relationships and can get quick results where I change the conditions. If I fail to understand something that I observe, there are plenty of other cheap snowbanks near at hand and I can start all over again and still get results in a relatively short time. To be sure, I may draw some dangerous analogies if I attempt to interpret the story of a stone in terms of the story of my snowbank, but at least I have something besides faith to base my conclusions on after I have worked with the snowbank. Having explored a number of snowbanks in this way, I feel genuinely sorry for the elementary youngsters who are compelled to study about snow primarily through accounts of the experience of the few Eskimos who build igloos, or of the prehistoric mammoths who got stuck in some exotic glacier. Why must we go so far out of our way to get illustrative material?

In these trying times of war and pillage, we are going to be forced to come back to earth and face the facts as they are right where we are today. It is high time that, in Science and Nature classes at least, we make a beginning of the study of units of time and of space that may be real to those with whom we are working. The philosophy of democracy is based on the assumption that each of us has the ability to draw rational conclusions from evidence that we choose to find for ourselves. It is important that that evidence be basically sound; not doctored to serve the interests of someone else. We can develop better judgment and more faith in ourselves by seeing what effect light has on ants and cockroaches than we can by learning that its velocity is something like 186,000 miles per second. We can easily conceive of the second, but 186,000 miles is a bit more than most of us can appreciate. Let us, then, consider light as it affects the plants in our window, the paint on our houses and the tan on our faces before we worry much about how fast it can travel through space. A pocket mirror and an ant hill should develop greater understanding on our part, and more faith in ourselves as fact finders, than most of the stuff on light offered us in the orthodox school activities.

It is not surprising that some of our regular teachers hesitate to begin teaching Nature and Science when in one book they read that the greatest distance between the earth and Jupiter is some 483 million miles, and in another more recent book they read that this distance is 576 million miles. In the first place neither they nor their pupils can conceive of a million miles, let alone the 93 million miles difference in these published figures. Furthermore, of what importance could this be to the average school child, or the average adult for that matter, as compared with hundreds of everyday problems that deal with comprehensible distances that are not ordinarily considered significant?

What is wrong with proposing that our school activities in the natural and the social sciences begin with the study of cause and effect in units of time and space that can be defined within the immediate or recent experiences of the children? The advanced scientists have learned to study the laws of genetics through the data provided by creatures with short life histories. Ecologists are beginning to recognize a significance in the microclimates to be found in the shade of a single tree, or in the ear of a particular animal. These life histories and these little climates can be juggled, changed, hastened, brought to an end and observed as units, while no man will live long enough to study many generations of his own species. Why, if these profound scientists recognize the dignity and significance of little things, have the pedagogues not been more than willing to do the same? But they must repeat, again and again, "space is vast," when they have not exhausted or explored reasonably the parts of the earth that they visit every day.

Some of our conservation programs begin with "discussing" whether the students would wish to have lived when Indians and buffalo roamed the plains and white men went around in covered wagons with their guns at their hips. Without considering really whether anyone would have preferred to sacrifice our modern conveniences for the romance of Indians, buffaloes and covered wagons, just what can we do about it anyway? We cannot go back to those days. We have to take the word of others about conditions that then existed. But we can definitely figure in plenty of things that affect living wildlife today. Because of these views this page cannot approve the new school program of the National Wildlife Federation in its present form.

Some of these conservation programs give abundant data on the amount of sediment dumped into the Gulf of Mexico, but fail to call attention to the initial acts of erosion that take place at the headwaters. At the recent meeting on Conservation Education held under Department Q of the American Association for the Advancement of Science, one teacher from Pittsburgh said that the only opportunity he had to teach about conservation was through the printed page, and yet I believe they have periodic floods in Pittsburgh. I also understand that rains clear the atmosphere there and I have seen the color of the river below Pittsburgh. Some of these phenomena are to me at least more significant than some of the data I have read on the rise and fall of the Mississippi Valley.

To be sure, I have collected oysters and whale vertebrae left in Arkansas when that valley was under salt water. From the rocks of central Iowa I have dug sponges that must have grown under salt water, and I have collected marine fossils in Texas, Nebraska, Mississippi, Ohio and other states of the Mississippi Valley. I admit all of this convinces me that great changes have taken place in this area over a long period of time, but that conviction was only academic until I had had some of the truly basic experiences. I am sure that I got more help in interpreting this situation from the many times I had watched real oysters living in real salt water. The Iowa sponges did not mean much to me because when I first found them I had never spent an hour of my life walking along a sea coast. They were strange, yes, but they could not transform an Iowa prairie to a sea bottom no matter how much I stretched my imagination.

Instead of studying the social life of colonies of penguins in far-off Antarctica let us study first the social life of ants, bees or starlings. Instead of reading about the changes in temperature on the moon, let us scan the temperature range in our garden in a week, within the throat of a flower in twenty-four hours, or underneath our fingernails or our armpits during a morning. Instead of imagining how a rocket plane might go from the earth to Mars, let us see how a dragon-fly nymph gets about.

Space is vast and time is great, but space is also small and time is also short. These smaller units should be more significant to our smaller students than the greater ones can ever be. We have imposed on our youngsters poems that were significant to grown-ups but not to the children. We have let our colleges dictate what is to be taught in the high schools, and, to some extent, in the elementary schools. Why can we not, in this time and space proposition, at least stick to units that will be truly significant to young learners? Let us try it. I believe it will pay good dividends in every way.

Young Naturalist

Miss Allyn L. Wood of 2502 North Alabama Street, Indianapolis, Indiana, is an enthusiastic young naturalist with a particular interest in herpetology. Feeling the need of stimulating interest and in providing a means of exchange of information and experience, she has founded the Young Herpetologists and Naturalists of America. Most of the present membership came from among those whose names have been listed from time to time in Nature Magazine as interested in corresponding about Nature subjects.

Miss Wood writes that the principles of the Y. H. N. A. are that "Nature in all forms should be better known" and "that natural life should be protected from those who, not understanding the order of things, might use it unwisely." To carry these principles into effect the organization has as its object to "further these principles by means of study and understanding, and the friendship and mutual help of the members." The society has no dues and its age limits are between 14 and 25. At the moment the organization is on a correspondence basis. If you are interested write to Miss Wood for further information.

Yes, Bees Are Busy

Proof that bees do get around, and are as busy as the popular simile indicates, comes from studies made by Frank E. Todd of the Pacific States bee culture laboratory of the U. S. Department of Agriculture and the University of California. An ingenious device known as a pollen trap enables the bee specialists to estimate closely the number of loads of pollen the bees bring back to the hive. From February 15 to November 1, one colony of bees averaged nearly 8000 loads a day. Each load represents visits to eighty or more blossoms, or an average of about two-thirds of a million flowers visited a day. For fruit growers the record is even more impressive. The bees speed up when the fruit bloom is plentiful, and during one day of the peak last spring this one colony brought in 29,000 loads of pollen. To gather this quantity would call for visits to roughly two and one-half million blossoms.

Identification Hobby

Harry L. Johnson of South Meriden, Connecticut, has an interesting hobby in the field of Nature study. He concentrates on the study and identification of trees and shrubs in winter by the use of buds, leaf scars and other characters of the season in the North. He would like to correspond or exchange samples with others who might be similarly interested. He is at present working on colored drawings of the winter twigs of trees and shrubs and wishes to enlarge his field.

Chicago Microvivarium

Through the elaborate magnification and projection apparatus of a microvivarium, visitors to the American Museum of Natural History are now able to watch minute, one-celled animals living in a drop of water move about, ingest food and carry on life processes. This exhibit has been established in the Hall of Animal Behavior.

BEHIND THE SEED PACKET

(Continued from page 162)

Science in the creation of new varieties, by offering "sports", or desirable new species from the vast areas of the world that have not yet been thoroughly plant-explored.

You can never tell when or where one of these epoch-making new strains or varieties will crop up. It might be in your garden or mine—if we only had the eyes to see them. It was my privilege to know the late Calvin N. Keeney of Le Roy, New York, who was head of N. B. Keeney & Son, then leading growers of garden peas and beans in the world. This firm since has been made part of the great Associated Seed Growers organization. Mr. Keeney was a delightful old gentleman, full of wit and humor, and with an eye that could spot a good bean (or a bad one) immediately. He told me how he started as a boy with a small patch of beans, which eventually developed into a vast business extending from coast to coast. His first discovery was a stringless bean, then unheard of and almost beyond the hopes of gardeners, who had been picking strings out of their teeth for years.

Young Keeney spotted this bean and worked up a small stock, which he offered to that enterprising seedsman W. Atlee Burpee, founder of the present house of that name. Mr. Burpee saw the possibilities of a stringless string bean and paid Keeney a good price—something like $100—for his stock and the privilege of introducing it. Under the name of Burpee's Stringless Green-pod it was introduced to a long-suffering world, and it has been the leading stringless green bean for many years. However, it took a good many more years of field selection to make the bean absolutely stringless. When Mr. Keeney told me this story, he chuckled at Mr. Burpee's shrewdness and said if he had known how valuable the bean was going to be he would not have sold it for what later in view of developments seemed to be a paltry price.

After that Mr. Keeney went on with his father to build up a large business, pushing on into Michigan and later into Idaho and other western states as conditions in the humid sections became more and more unfavorable for the growing of his crops of beans and peas.

Probably you never heard of Calvin Keeney before. That would not be strange, as he belonged to that group of great seedsmen who, like the Bodgers, are exclusively wholesale growers, and who shun personal publicity, preferring to let their horticultural creations speak for themselves. But his efforts to improve the varieties of beans and peas and to keep the standards of his profession high were colossal, as everyone in the trade recognized, and deserve to be better known to lay gardeners than they are today.

We thus see that there is a good deal more in a packet than a spoonful of radish seed, a pinch of petunia dust, or a fistful of beans done up in colorful package. We have all sorts and conditions of seedsmen, ranging from the small grower, who specializes in one kind of plant, to the retailer who grows nothing at all. There are the large growers, wholesalers and retailers, such as Ferry-Morse, Northrup King & Co., Burpee,

(Continued on Page 171)

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LOOK FOR THE LEAF ON THE PACKAGE

More on Earthworms

No article in Nature Magazine has stimulated more response than that entitled "Harnessing Earthworms" in our January, 1941, issue. We were not prepared for the several hundred letters we received asking for further information, but these have been acknowledged and handed on to the California Earthworm Farms, 6164 N. Figueroa St., Los Angeles, as rapidly as the time of our overburdened secretary would permit.

We had been given to understand that the article had been checked by Dr. George Sheffield Oliver. Too late we discovered that certain over-statements had been allowed to creep in, due apparently to an excess of enthusiasm on the part of the author, a man who has a long-established record for accuracy and careful statement. These errors were largely on points that would have been stronger had they been qualified. The author did not, however, over-state the fundamental importance of the earthworm, or the work done by Dr. Oliver and others. Through the publication of the following letter from Dr. Oliver we are happy to correct and qualify certain statements:

Editor, Nature Magazine:

Being a modest man, I must admit that my ears were "very red" after reading for the first time your most interesting article on "Harnessing Earthworms," which appeared in the January issue of Nature Magazine. The author, John Edwin Hogg, has lifted me bodily out of a very prosaic and matter-of-fact background, placed me on a pedestal in company with such immortals as Charles Darwin, and, in general, created a picture that would be exceedingly difficult to live up to. Therefore, in strict justice to Nature Magazine, its readers and particularly to myself, I feel that certain corrections, revisions and restatements should be made, even at this late date. At the time Mr. Hogg submitted the manuscript to Nature Magazine, I was away from the city and not available, otherwise we would have gone over the original draft of the article together for checking purposes.

In reading the article in question, I find that it gives the general impression that earthworm culture offers an easy, royal road to quick wealth and independence. Such is not the case. As a matter of fact, the results I have obtained represent many years of hard—often discouraging—work and study. On this point, I will quote briefly from volume one, page 28 and 29, of my book, *Our Friend, the Earthworm:*

". . . It behooves us to deal with facts as facts and not become lost or confused in a maze of over-enthusiastic statements, over-zealous predictions; neither should we imagine that overnight wealth awaits all and sundry who would enter this new development of a natural resource that has been active on this planet long before man himself arrived. . . . Financial security may be assured, but certainly not by any magic power concealed in or about the culturing of worms for commercial use. . . . And so, in justice to all persons contemplating entering this interesting and profitable line of endeavor, it is sincerely hoped that readers of this book will not invest large amounts of money in worm farms under the assumption that they will become financial overlords overnight. To use a common expression, it just isn't in the cards."

Perhaps the most important correction that should be made is in the figures attributed to Charles Darwin about the earthworm population of an acre of English soil. Here Mr. Hogg has evidently gotten his notes mixed with the figures of later investigators than Darwin. After geological ages, Mr. Darwin estimated that, in round numbers, earthworms inhabited some of the soils of England in numbers ranging from twenty-five to fifty thousand, and that, in these concentrations, they produced on the average more than ten tons of castings per acre annually. Mr. Hogg's figures place the earthworm population of an acre at two and one-half millions. Based on Darwin's carefully estimated and conservative findings, two and one-half million earthworms would produce over five hundred tons of castings per acre annually.

We attribute Mr. Hogg's error on this point to our discussions about intensive earthworm culture, in specially prepared beds, where we breed and have working as many as three thousand earthworms to the cubic foot of material. When you consider that a concentration of 50,000 worms per acre is only about one worm to the cubic foot of material, the error of statement can be fully appreciated. In more favored regions of the world than the soil of England, vastly greater earthworm populations have been discovered by later investigators who came after Darwin. For instance, on the University Experiment Station farm for the State of Ohio, investigators found earthworms inhabiting bluegrass soil in numbers as high as one million to the acre, concentrated in the upper eighteen inches of top soil. Investigators in the State of Oregon found earthworms in some localities ranging in numbers from 500,000 per acre to as high as 1,500,000 per acre. In a study of the action of earthworms in the cotton-growing country of the Anglo-Egyptian Sudan, investigators for the government of Great Britain estimated that in the intensive growing season of six months, following the overflow of the Nile River, the castings of the earthworms amounted to approximately 120 tons per acre. This amount of castings would indicate an earthworm population of more than 1,500,000 per acre. In this region, the annual overflow of the Nile furnishes earthworm food in excessive abundance, which would support a very great number of worms.

In connection with the above, we will point out that the earthworm population of a given locality will be limited by the amount of earthworm food present in the environment, plus moisture and other necessities for a prolific worm population. Therefore we cannot set any arbitrary figure for the number of worms which should be provided for land in general. As a practical thing, in earthworm farming, numerous colonies of worms are established on the land to be impregnated, the worms rapidly multiply and will finally reach a balanced population which will be limited by the amount of food available for them in that particular piece of land.

On another point—the harvesting of earthworm egg-capsules—Mr. Hogg's statement must be qualified and revised to give a true conclusion. In intensive earthworm culture, it is true that millions of egg-capsules will be produced in the proper culture beds where the best environment is provided and the proper food requirements of the breeding worms taken care of. However, Mr. Hogg states that "Dr. Oliver harvests a million earthworm egg-capsules about as easily as he gathers a dozen eggs in his henhouse." Positively, it is not so simple as that. As a matter of fact, the harvesting of egg-capsules is a tedious job of hand labor. The capsules are picked out, one by one, as the damp earth is sorted through the fingers. In good culture, an expert picker may gather from five thousand to eight thousand earthworm capsules in a day of eight hours. Even allowing a maximum production of 8000 capsules per day, it takes an expert picker at least 125 days to harvest one million egg-capsules. The above is just one of the reasons that earthworm egg-capsules sell for one cent each. Based on careful observation, we would consider an average of three worms per capsule as very close to the correct figure of production. As high as twenty earthworms *have* been hatched from a single capsule. On the other hand, in some species there is only one fertile egg per capsule. Fortunately, in earthworm farming by the practical farmer or gardener, it is not necessary to segregate the capsules. Special breeding beds are maintained, where the worms are fed intensively in vast numbers. In establishing a large earthworm colony at any point desired, we simply take a gallon of the compost from the earthworm bed, containing many worms, with many capsules, and plant this culture. We thus establish a breeding point in the earth which we wish to impregnate and the colony rapidly spreads from this center. To cover an acre of ground, we establish numerous colonies, from which the worms will spread to the entire area. Once established they are there permanently.

Still another point in Mr. Hogg's article that should be qualified is the question of hybridization. In my years of experimenting, seeking to produce a breed of earthworm that would answer all the requirements of a practical culturist, I succeeded in producing what I claim to be a true hybrid earthworm, obtained by crossing the orchard worm and manure worm. My claim on this point is subject to verification, of course, by other experimenters. This worm, which I have termed the "soilution" earthworm, is especially adapted to intensive breeding in culture beds, and readily adapts itself to a wide range of soils and varying environments, besides having certain important points. However, I make no claim to hybridizing earthworms to order. Earthworms are slaves to their environment, and, by selective breeding and feeding, most any variety can be rapidly modified for a special purpose. So, for instance, if we want an earthworm that is large and meaty for frog feeding, we select one of the larger species, and through special feeding and selective breeding we soon have worms that will furnish the maximum feed for frogs.

Now, on the question of poultry and other fowl, some correction and clarification should be made. In the utilization of the earthworm in poultry raising, many things must be taken into consideration. In the technique used, the poultry is just a part of the self-contained farm economy, the same as other animals. In actual value, the by-products of poultry raising are as valuable as the actual meat and eggs produced. It would take too much space to discuss in a letter, so we will just consider one point—the saving in feed cost. In the conversion of dry feed into saleable meat for human consumption, 100 pounds of dry feed for cattle produces 4 pounds of human food. One hundred pounds fed to sheep produces 5 pounds of available human food. One hundred pounds fed to hogs produces 11 pounds of available human food. We do not have the exact figures for the conversion

value of chickens as transformers of coarse feed into available human food, but know that the figures are similar to these for other animals, probably a little higher. In our experiments in practical poultry raising, utilizing the earthworm, we have been able to reduce the food cost fully one-half, at the same time producing superior meat and superior quality of eggs. In addition, all of the waste products—droppings, etc.—are converted by the earthworms into highly valuable soil for the increase in the fertility of the soil. There is no waste where earthworms are utilized for disposing of all biological end products of life. Thus, in considering all points, a saving of one-half in food cost in the handling of poultry is a very great saving, when we consider the comparative conversion value the ordinary cultural methods of poultry raising, and that which we have called the "intensive range" method.

In conclusion, I will again point out that while earthworm farming does not offer any quick and easy road to wealth, it does offer a new field of endeavor, which, if gone into in the right way will mean greater profits, greater security and greater living satisfaction to all those who love the soil and who are interested in a better way of life. To utilize the earthworm in the new agricultural technique, it is only necessary to learn a few simple and easily mastered rules for establishing the proper culture beds and the breeding of earthworms, secure a supply of earthworms to start with and then, from this start, breed the earthworms in sufficient numbers to impregnate the land you are working with. For the small farmer or market gardener, utilization of the earthworm offers the greatest possible opportunity for the intensive production required, at the same time enabling the farmer to keep his soil in a high state of fertility at the minimum cost.

Constructively yours,
George Sheffield Oliver

A NEST WITH "STEPS"

(Continued from page 163)

clan and perch in the tree. But instantly it "hung up" like a hummingbird before a dead twig, plucked it off and flew away to its nest.

The manner of nest building is one of the swift's characteristics. Its salivary glands are highly developed and their mucilage-like secretion holds tightly together the rough sticks of its nest. Species found in the Orient build their nests almost entirely of this mucilaginous substance, and Chinese and Japanese epicures consider them a great delicacy.

The picture accompanying this article shows a most unusual nest, both as to site and structure. In some bird-banding excursions during the summer of 1937, along the north shore of Lake Superior, the chimney swift's nest here described was discovered. It was located in an abandoned two-story wooden shack, half demolished by the waves and the ice, on the rock shore of the lake. In a small room on the second floor of the building, I was surprised to find two chimney swifts clinging to the walls with their sharp claws and supported by their spined tail shafts. I at first supposed they were young birds that had escaped from some adjacent chimney. I had little difficulty in catching them and found that they were mature birds. After they were banded and released, I looked about and was much surprised and delighted to find the unusual nest glued to the beaverboard wall covering, up near the slanting cornice of the ceiling. It was the usual, shallow, narrow structure, a small handful of coarse sticks fastened together against the beaverboard. The unusual feature of the nest was that there were scattered along at the side of it, and extending slightly downward along the wall, a broken line of single sticks glued to it, some two or three inches apart, forming what looked like a sort of miniature stairway for the swifts. The beaverboard was worn off to a lighter color just above these sticks, showing that they were being used by the birds apparently as aids in perching or roosting in the manner characteristic of the swift. A section of the beaverboard, with the unusual nest attached, now rests, as a permanent exhibit, in the Chicago Academy of Sciences.

BEHIND THE SEED PACKET

(Continued from page 169)

Breck, Dreer, Vaughan, Peter Henderson—to name but a few. There are others who are primarily mail-order seedsmen, who do some breeding and growing, such as Jos. Harris Co., H. G. Hastings Co. and Germain. In addition to the Bodgers, there are several, including Waller-Franklin and Wm. MacDonald, of California, who grow flower seed for the trade exclusively. There are a number of wholesale growers for the vegetable trade. Then there are seed farmers who grow for the big firms on contract, and plant specialists and nurserymen who sell seeds, some of which they grow themselves.

There is no opportunity here to go into the international phases of the business, except to suggest that it has been greatly interrupted by war and blockade. There will be some shortages of seeds of which we normally imported a considerable percentage, such as spinach, cabbage and related crops, herbs and some flower seeds. But American seedsmen are capable of taking care of their end of the job and are already well on the way to self-sufficiency by the 1941 harvest in most of these items, and by the harvest of 1942 with the biennial crops such as cabbage and beets. Meanwhile, if you are fond of spinach, you had better get your seed order in early, or else plant Swiss chard or some other substitute for greens.

As to the much-boasted superiority of English flower seeds, there is no need to go into that here, except to point out that while certain English strains are undoubtedly finer, English gardens are superior (when they are) mainly because Britons are, as a people, better gardeners. Also, and this is important, they have, on the whole, a more favorable climate for the perfection of many flowers and vegetables. However, it is an open secret that large quantities of English seeds are grown in California on contract (sweet peas for instance) where the sunny skies are more favorable for the ripening and harvesting of seeds than the showery English climate. When you pay a premium for English seeds you *may* be getting special strains grown in Britain, and again you may be getting seed grown in one of the fertile valleys of California, and which has had a round trip across the North Atlantic.

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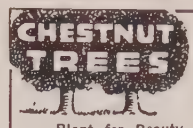

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

(Continued from page 127)

often the 'conquest of nature' benefiting immediate generations has resulted in the 'conquest of man' by those natural forces operating into eternity." *Land Economics* is certainly excellent reading for those who wish to give serious consideration to our conservation problems, especially those who are motivated by zeal and enthusiasm, for it affords a most helpful understanding of important economic factors and at the same time deals with all aspects of conservation.

It seems to me to be highly significant and encouraging to see in these important volumes definite evidence of the fact that our wildlife and other conservation problems have come to share in our major economic thinking. When economists discuss the requirements of conservation, and conservationists explain underlying facts of economics, it seems to me that our national policies are bound to include sound and continuing programs for conservation. Dr. Gabrielson describes his book as "an effort to put into simple language the basic facts in this field and to emphasize that the various programs for the conservation of soil, water, forests, and wildlife are so closely interwoven that each vitally affects one or more of the others." The volume demonstrates that such considerations are affecting national policy, and it should be helpful indeed for every citizen to read it.

Perhaps it is our duty, each spring, to mix concern with our awakening interest in the outdoors, and if so perhaps we should also pay heed to the literature of concern as well as to that of charm. The rewards of our concern, of course, are economic in part, but also they have to do with those intangible enjoyments we call esthetic. Water impoundment is a rather prosaic subject, but impoundments may help waterfowl, and . . .

"It was a March day," writes Mr. Armstrong in *Birds of the Grey Wind,* "and the clouds lay low over a city . . . there, above the belching mill chimneys dimly visible in the misty pall were about a hundred and fifty geese. All that day I was traveling over mountains, islands, seas with them; the soot and squalor, the thronged streets and the din of traffic were banished for me. Such is the magical power which a few wild birds may wield."

Poems by Packard

He Dropped into Poetry. By Winthrop Packard. Published by the Author at Canton, Massachusetts. 116 pages. 1940. $2.

Between the covers of an attractive little book this widely-known ornithologist and conservationist, long the head of the Massachusetts Audubon Society, reveals himself as a poet of charm and understanding. Here are some eighty poems, some being Nature poems, others sentimental, narrative, serious, for children, or facetious, with a final quintet of Irish poems.

Shakespeare's Birds

The Birds of Shakespeare. By Lavonia Stockelbach. 1940. 52 pages. Available from the author, 25 Gordon Place, Verona, N. J. $1.

The Bard's references to birds were many and interesting, and Mrs. Stockelbach has ferreted them out and lists and analyses them. After introductory comment, she discusses the song birds, birds of sombre hue, the small birds, the game birds and the birds of prey. Both to ornithologist and student of Shakespeare this little booklet will be valuable.

Nostalgia by Seasons

How Dear to My Heart. By Mary Margaret McBride. New York. The Macmillan Company. 1940. 196 pages, with illustrations by Elmer Hader. $2.

In the prose of personal conversation, the fond recollections of Miss McBride's childhood in the country are told eloquently in such chapters as "Snow on the Farm", "Ornery Pets and Visitors", and "County Fair", grouped by the four seasons of the year. The book is sure to stir the emotions, in memory or something like envy. Mr. Hader's illustrations are appropriate and felicitous.

About Galls

Plant Galls and Gall Makers. By Ephraim Porter Felt. Ithaca, N. Y. The Comstock Publishing Company. 1940. 364 pages, with halftone and line illustrations. $4.

Here is a guide to the immensely interesting and relatively unknown insect galls and their makers. In the text are elaborated the relationships between gall producers and their plant hosts. The mysteries of gall production are many and fascinating, and this is an important text in a highly specialized field.

Shipwrecked

Inagua. By Gilbert Klingel. New York. Dodd, Mead and Company. 1940. 384 pp., with illustrations by the author. $3.00.

We have been regrettably delayed in reviewing *Inagua* by Gilbert Klingel, but that is partly Mr. Klingel's own fault. We started to read the book and soon concluded that it was so excellent that it must be thoroughly and carefully read before we wrote about it. But, forthwith, we ran into pressure of work and an inadequate number of hours of the day. We have now completed *Inagua* and hope that many others will have the opportunity and desire to do the same. Inagua is the name of a "very lonely and forgotten island" in the Bahamas upon which the author and his companion, Wally Coleman, who had set out on a scientific expedition, were shipwrecked. After tenderly planning the building of the *Basilisk,* a thirty-eight-foot sailing ship, equipping it with the aid of the American Museum of Natural History, the two set out.

The first three chapters are as thrilling a piece of writing as we have encountered in many a day; the story of the terrific fight against the storm is outstanding. When, finally, all the months of planning bear fruit on a jagged reef with loss of ship and much material, it seemed as though "the expedition was washed up—literally." But it was not. After some odd experiences with the peculiar powers-that-be on Inagua, Mr. Klingel went on to collect and to study, and the story of this work (actually distilled from two expeditions) is fascinating. For this we may thank Klingel's mastery of the English language. Some of the charms of the book, beside the manner of its telling, lie in the author's philosophy and in his picture of the web of life as he found it on this island outpost.

It is impossible to do justice to *Inagua* in a necessarily brief review. Perhaps we can sum up our enjoyment of the book best by saying that we wish that we could have been along, because, through his book, we like Gilbert Klingel immensely. We are delighted that Dodd, Mead and Company have given us this opportunity to become thus acquainted.

Useful Directory

The Naturalist's Directory. 1940. 292 pages. Published by the Cassino Press, Salem, Massachusetts. $3.

This directory includes names and addresses and data concerning the particular interests of more than six thousand naturalists in North and South America. It also includes a list of natural history museums and important scientific periodicals. It has been termed the "Who's Who" of the natural sciences. The listing includes amateur and professional naturalists and inclusion is without charge. The 1940 edition is the thirty-second edition.

Bi-illogical Poems

Nature Smiles in Verse. By Bernal R. Weimer. 1940. 100 pages, with illustrations by Miss Bobby Murray. Available from the author at Bethany College, Bethany, West Virginia. $1.50.

Dr. Weimer, who is Professor of Biology at Bethany College, has compiled both a unique and entertaining anthology of what he calls "bi-illogical poems." There are ninety-nine of them—if we counted correctly—including several by the compiler, and two or three by the illustrator. Dr. Weimer groups the poems under such headings as Biologists and Doctors; Paleontology; Physiology, or How We Tick; Botany; Evolution; Invertebrates; On Vertebrates; Heredity; Genus—Omnibus, and Embryology. It seems to us that Dr. Weimer has made a distinguished contribution to science of the sort that science can well use. And there is no question about the entertainment value of his anthology; it is a "must" for scientists with a sense of humor, which gives it a large market.

Local Geology

Geology of the Cleveland Region. By Arthur B. Williams. Cleveland. The Cleveland Museum of Natural History. 1940. Sixty pages. Illustrations. Fifty cents.

This is the ninth in a series of pocket natural history texts, and the first in the geological series. The title is descriptive and the booklet will be invaluable to anyone interested in the geology of the region indicated by the title.

CONCERNING CROCODILES

(Continued from page 158)

answering bellow. It did not come. I wondered if José had slipped in a false quarter-note. However, I withheld any feeling of disappointment, and stood by for the next effort. It soon came, three lusty bellows with short intervals between. Then things began to happen. Out of the darkness ahead came the right answers. José made the call again, and again came the answering grunt, deep and thunderous—this time much closer. I really was proud to know José. He whispered to the boy astern, who brought the canoe to rest quietly against the soft bank. Again his call boomed past my now much-punished ear, and again came the echo-like response. The Mauser was off my knees.

"*Jacaré grandé,*" muttered José as he snapped on the lamp, directing its long widening beam over my shoulder into the blackness ahead.

Just beyond the range of its greatest power, under the shadows of some low-hanging draperies of bamboo, two burning balls loomed up like smoldering embers. The space between gave sure evidence that a huge *jacaré* lay behind those luminous and betraying orbs. Fortunately the brute had left the water and crawled up the bank about three feet from the edge, and I noticed that a strong odor of musk now freighted the night air. I also heard and could dimly see its tail thrashing the mud while I aimed a trifle below the center of those fiery bull's-eyes. As the stillness reverberated with the report the red eyes vanished.

"*Jacaré morté,*" chortled José. I thought I could actually feel his grin in the dark, as keeping the light's beam ahead, we paddled about fifty yards to where the eyes had gleamed. That "croc" had made his last grunt. We attached the painter to the tail and snaked the carcass to the water's edge. As far as I was able to judge it had been about fourteen feet in length, a really formidable spectacled-*caiman.* I say "short time" advisedly, for hardly was the taint of blood in the stream than any idea I might have entertained of taking the hide was preempted by what seemed to be hundreds of *piranhas.* They took complete command of the situation, ripping at the exposed flesh with greater fury than bluefish running amok among a school of menhaden. Nothing short of dynamiting the stream could have frustrated their wild orgy. We retired a short distance and watched them by the light of the flash-lamp, and under such weird lighting it was a scene of savagery never to be forgotten. I could not but think of our "happy landing" two hours before, and what might have happened if we had capsized in the darkness.

I made a few more similar night trips with José, and saw many more eyes gleam red, but this first excursion had dulled the edge of my appetite for killing "crocs," or providing meals for blood-thirsty fish, and from then on my most deadly shots were made with a camera.

Pennsylvania Birds

Birds of Western Pennsylvania. By W. E. Clyde Todd. 702 pages; 118 species in color; text figures; maps of breeding ranges. University of Pittsburgh Press. 1940. $5.

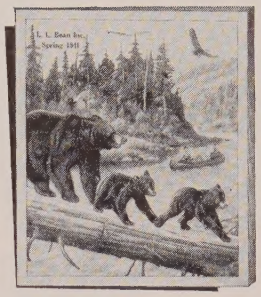
When I came to Washington in the Spring of 1892 one of the first of the young ornithologists I met at the Biological Survey was W. E. Clyde Todd. I had not known him many days before I learned that he had lived in Beaver, Pennsylvania, where he had studied the birds for several years, and that his pet ambition was to write a book on the birds of that region. Each summer he spent his vacation in some part of western Pennsylvania, patiently tracing out the breeding ranges and learning the nesting habits and songs of all the birds. His ability to recognize the songs and even the faintest cheeps was marvelous to me; indeed, I have never met anyone his equal in this art. Thus the "chip" of, say, a Nashville warbler, if he had once heard it, was instantly identified. In June and July, 1893, I spent several weeks in behalf of this prospective book, crossing the Alleghenies and the lesser ridges to the westward on foot, and searching out the hidden nests of many a rare bird among the tangled rhododendrons, or on the brushy summits.

Thus, as I read, to cite one locality, my mind goes back to those days spent at Crumb, near the summit of the Alleghenies in Somerset County, and the pair of brown creepers that nested beside the household spring, the magnolia warblers raising a family in a nearby low hemlock, the flock of noisy ravens visiting the great forest down the valley, and the trip to the high knob a mile or so away, where, amid the oaks and chestnuts, a wild turkey flew heavily from her eggs, startling the chat that had been serenading her long vigil. Thirty-three years later I walked unannounced into my host's dooryard, and after a few moments conversation, asked him if he remembered a young man who had once studied the birds about his farm. Instantly he seized my hand in a firm grip as he said: "Hello, Ed, how are you? I'm glad to see you again!" Well, of such is the stuff that regional lists are made.

In the years that followed Todd's removal to Pittsburgh our paths diverged oftener than they met, for my work took me to the West and to Alaska and northern Canada, while he, perhaps, was crossing Labrador's barrens. But always I knew that, whenever opportunity offered, he was following the ambition of his youth. Various circumstances delayed the completion of the book, but it finally appeared in the early summer of 1940. Few hailed its appearance with more satisfaction than I did.

It is not often that a regional list of birds has the benefit of so long a preparation, and by so earnest a student, and one who has lived so close to his subject. This forty-odd years of study enables the author to note the changes that many of the species have seen. In some cases they have increased, in others they have suffered diminution. One would wish that his treatment of this subject could have been amplified in some cases. The illustrations in color are from the accurate brush of George Miksch Sutton; all are reproduced about one-third natural size. The long lists of references under synonyms, a feature formerly thought necessary in all such works, could well have been shortened. Altogether, however, one finds little to criticize in the work. Each species is treated under several headings—description, range, migration, habits—and for some species the zonal distribution. The Geography, Physiography, Ecology, Climate and Life Zones, Present Status of Bird Life, and Field Work are fully and ably discussed in the introduction. There is a good index, and an excellent bibliography. I predict that this fine book will long stand the test of time.

EDWARD A. PREBLE



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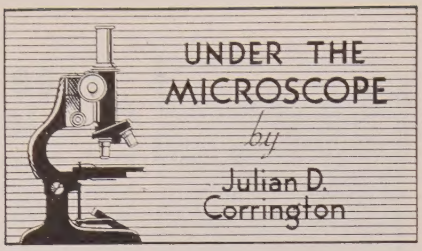


Micrometry

Our subject for this month is one of the two remaining operations of importance in microscopy that have not yet been discussed in these columns—the other one being drawing. As the two are closely related we shall take them up serially, so you may expect an article next month on drawing with the microscope.

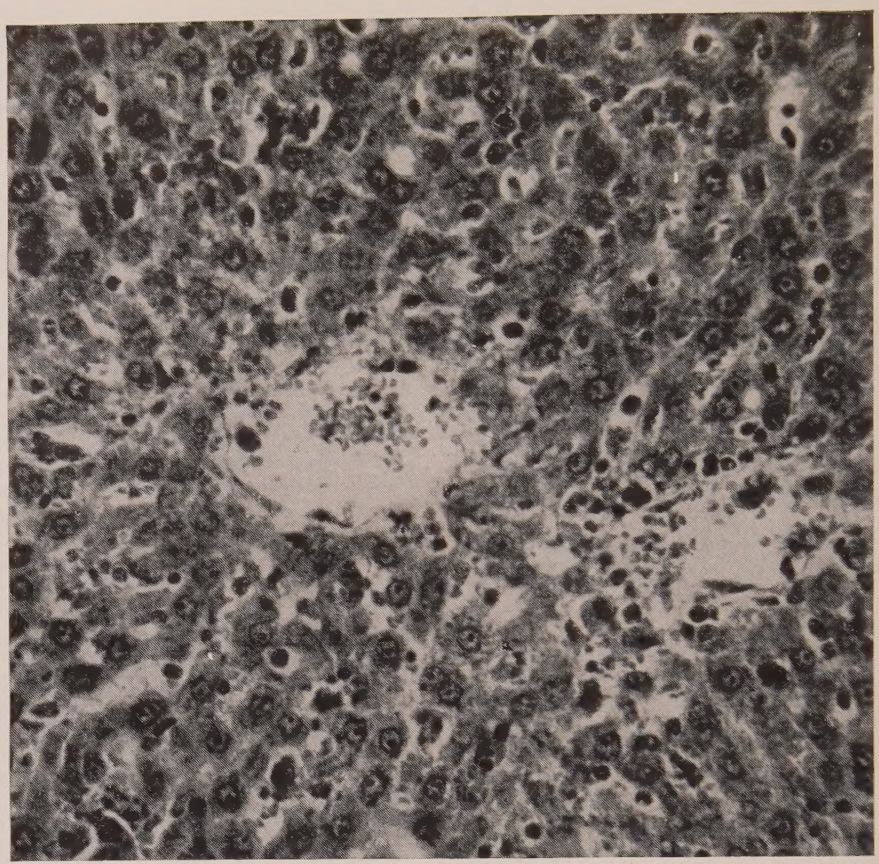
Micrometry, pronounced mī-krŏm′ĕ-trĭ, is the art of making very minute measurements with a micrometer, which in turn has two meanings. In mechanics the word micrometer is used as a short form for micrometer caliper, a gauge to determine very small thicknesses, such as .001 or even .0001 inch; in optics, a micrometer is an instrument employed with a telescope or a microscope to measure minute distances or sizes of objects.

The simplest of such methods in microscopy is that of comparison with an object of known dimensions, and the best example for an estimate of this sort is that of comparing structures with red blood corpuscles in any section of human tissues or organs. The human red corpuscle has been measured many times and found to vary but little from a uniform diameter of 7.5 micra. One micron equals one one-millionth of a meter, or one one-thousandth of a millimeter (.001 mm.), about .000039 inch. Therefore if a cell or its nucleus, a parasite, a small blood vessel or other object appears in the same field of view with one or more red corpuscles—and there will almost always be at least some blood cells in any field—one may conjecture fairly accurately the lengths or diameters of desired structures. One of our pictures is a section of human liver showing two blood vessels containing corpuscles, in illustration of this method.

If your microscope is equipped with a mechanical stage having graduated scales, a hair pointer can be placed in the eyepiece and its tip set at one edge of an object in the field. Actuate the stage until the hair tip lies upon the opposite edge of the structure, then make a direct reading from the horizontal scale, thus obtaining a fairly accurate figure that will be satisfactory for larger subjects.

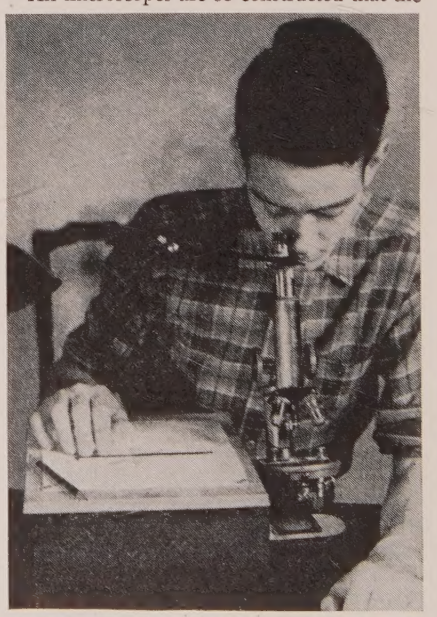
By the proportion method, one measures the width of the entire field by the mechanical stage, then estimates what proportion of this distance is occupied by the material to be measured.

The method of double vision has not received its proper share of attention in the literature on microscopy, but the writer finds it extremely easy and recommends that his readers give it at least a trial or so. With the microscope in erect position on the table before you, have a sheet of drawing paper and sharply-pointed pencil close against the base of the instrument on the right side. Using a drawing board, pads of paper, magazines or other wide, flat objects, block up the sheet to be drawn on until it lies 250 mm. below the eyepoint of the microscope. The eyepoint is that location just above the ocular where rays of light coming up through the microscope cross one another and is the proper point at which to place the eye during studies with the microscope. It varies from ¼ to ½ inch, according to the power of the ocular, and may be determined accurately by using a strong light and holding a sheet of white tissue paper above the eyepiece, working at night in a dark room, or shading the eyepiece from too much outside light. That distance at which the circle of light intercepted by the paper is smallest and brightest marks the eyepoint.



SECTION OF HUMAN LIVER, 400X, SHOWING TWO BLOOD VESSELS CONTAINING RED CORPUSCLES BY WHICH ESTIMATES OF SIZES OF OTHER OBJECTS IN THE FIELD MAY BE MADE

All microscopes are so constructed that the distance to which the virtual image that one sees is apparently projected below the eyepoint is 250 mm., and this is termed the image distance. Hence if the drawing paper is also located just 250 mm. below the eyepoint, any replica of the image drawn thereon will have a 1-1 ratio as to size, and measurements can be made with exactness.



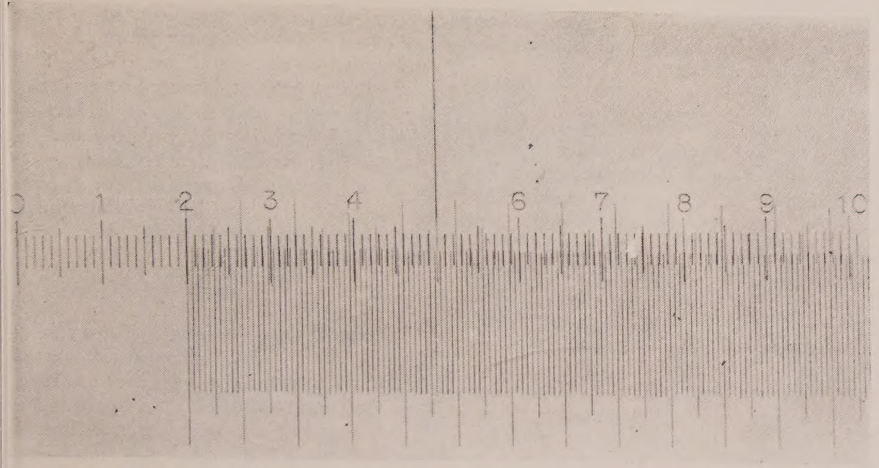
USING THE ABBE CAMERA LUCIDA TO PLOT A DRAWING OR MEASUREMENTS OF AN OBJECT UNDER THE MICROSCOPE

Use as object a slide with large and contrasty structures, well stained; a section of intestine, or of tree root or stem, for example. With low-power optics sharply focused, look at the field with the left eye and keep both eyes open and relaxed, without squint or strain. Hold the pencil in the right hand, pencil point upon the drawing paper, fairly close to the base of the microscope. Make no conscious effort to see with either eye; just relax and look. Move the pencil point about slowly. Occasionally, or perhaps more or less continuously, depending on how accustomed you are to keeping both eyes open in microscopic observations, you will see the pencil point apparently moving around among the tissues on the slide. The trick is not at all hard to master with a little practice.

Once the double vision ability is acquired, it is a simple matter to sketch outlines of objects on the drawing paper or to mark off dimensions with dots. Of course, if you are left-handed, reverse all of the positions specified above.

Exactly similar is the use of a drawing ocular or the device known as a *camera lucida,* by means of which a mirror image of the pencil point and drawing paper is superposed on the image of the object under the microscope, enabling one to make direct tracings. Further details on these drawing aids will be given next month.

In either case the lines or dots plotted on the drawing paper give you the *apparent* size



THE VIEW OBTAINED THROUGH THE MICROSCOPE WHEN AN OCULAR MICROMETER (THE NUMBERED SCALE) IS FOCUSED ON A STAGE MICROMETER. THE TWO ARE COINCIDENT AT #2.100X

of the object sketched or measured. Two methods are available in order to find out the actual size. First, without changing any of the adjustments, remove the object slide and substitute a *stage micrometer,* which is a glass slide with a finely-ruled scale engraved upon it, available in either millimeters or inches. We recommend the metric scale, graduated in 0.1 and 0.01 mm. Since this scale will be magnified to exactly the same amount as the object previously sketched, its image, when seen upon the drawing paper by either the double vision or camera lucida procedures, provides a means of direct measurement. The result is the same as if we could put a ruler upon the object itself.

The same routine may be followed if you use the microprojection method, discussed in our December, 1940, issue. Place the screen exactly 250 mm. from the eyepoint of the ocular, the image being then a counterpart in size of that seen when looking into the microscope in the ordinary way. Use a sheet of paper affixed to the screen, or as a screen, and plot outlines or measurements of objects as before, then substitute the stage micrometer for the object slide.

Passing over several other minor methods, there remains the important one employing an ocular micrometer. Remembering that the real image formed by the microscope objective plus the field (lower) lens of the eyepiece is brought to a focus at the level of the eyepiece diaphragm, where it is then scanned by the eyelens (upper element) of the ocular, we can see how it is possible to introduce a ruled scale at this level, which will then be projected with and upon the virtual or final image at the image distance of 250 mm.

Unscrew the top lens of your eyepiece and note a platform extending part way across the barrel; this is the *eyepiece diaphragm.* If you would like to have a pointer in your ocular, cut a short piece of a single hair from the head of someone with fine hair, and with two forceps, stretch the hair across the middle of the aperture of the diaphragm, affixing each end to the platform with a tiny speck of balsam. When this adhesive has dried, snip the hair in two just barely to one side of the center, then remove the longer half, balsam and all. Replace the eyelens and insert ocular in tube. Looking through the microscope at some slide you will now see the hair lying apparently in the field, and by means of twirling the ocular and moving the slide, the exact tip of the hair may be placed upon any desired object.

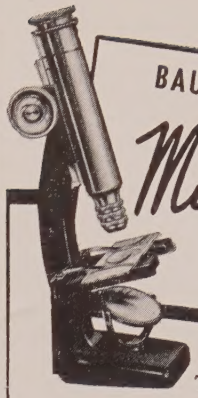
In similar fashion, a cover glass on which a fine scale has been engraved may be placed, ruled surface down, on the eyepiece diaphragm, and when sharply focused will appear to lie in the field upon the object. Such an appliance is termed a *micrometer disc,* and, when thus introduced within your ocular, provides you with a *micrometer eyepiece.* Instead of a scale, finely-ruled squares may be used, giving a counting chamber for determining the number per area of dust particles, mold, bacteria, or other minute bodies. There are also available for those who do a great deal of this work more elaborate micrometer eyepieces, incorporating movable scales or cross hairs.

If the micrometer disc is not exactly in focus along with the object, unscrew the eyelens slightly until such a focus is obtained.

The final task consists in calibrating the ocular micrometer in order to find out the value of each of its spaces. This must be done for each combination of optics used, but once determined for a given objective and tube length, the figure is recorded and the operation need not be repeated.

Let us assume that you wish to find out the actual length of a fixed and stained specimen of paramecium on a permanent slide. Mount first the stage micrometer and focus sharply on this with the eyepiece micrometer, superposing the two scales and rotating the eyepiece to have the two parallel. Now move the stage micrometer so that the first marking at the left end of its scale will exactly agree with the first, left-end ruling of the ocular scale—or for that matter, that any two major divisions correspond. Look to the right to find some other pair of lines of the two scales that precisely match. Suppose, for example, that it takes exactly eight of the ocular divisions to overlap 1 mm. on the stage micrometer. Divide the number of stage divisions by the number of the eyepiece divisions and the quotient will give you the value of the eyepiece scale; in this case divide 1 by 8, the result being 0.125 mm., meaning that each division of the ocular micrometer at the magnification employed has an actual length of 0.125 mm.

Substitute the paramecium slide for the stage micrometer and move it until one division of the eyepiece scale is flush with the left end of one of these protozoans, then read off how many divisions are necessary to include the whole cell. Multiplying the result by the ocular micrometer factor, 0.125, will give the true measurement of the paramecium



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in millimeters, regardless of magnification. As long as none of the variables are altered, as objective or tube length, this same factor will hold for any object whatever. It is good practice, then, to make a recording of this factor for each of your objectives, for all future uses.

The second method for determining the actual size of dots or lines drawn on paper by the double vision, camera lucida or projection devices is to divide the apparent size of the object by the magnification of the microscope. For example, if the camera lucida image of a human red blood corpuscle measures 3.25 mm. with an ordinary ruler and the magnification used was 430X, the quotient is 0.00756 mm., or 7.56 micra.

For this purpose you may take the stated magnification of the manufacturers, i.e., that the objective is actually 43X and the eyepiece a true 10X; 43 times 10 is 430X. However, it is much more scientific to determine the total magnification for yourself and cases may arise where the magnification of a lens is not stated, or is increased an unknown amount by pulling out the drawtube. You may also care to know the magnifying power of various combinations for purposes other than micrometry or drawing.

Mount the stage micrometer and project its image upon a paper screen or draw it with the camera lucida, in each case at the image distance of 250 mm. Measure the image with a metric rule, and the ratio gives the magnification.

Trade Notes

Our current catalog offering invades a new field and one we have long sought to make available. The amateur working alone often finds great difficulty in securing a sufficient stock of biological stains without tying up too great an investment and buying quantities he can scarcely expect to use up during an entire lifetime. Realizing this situation fully, we have hoped that some firm would come forward with a workable scheme to make small quantities of stains available at low cost, and so are happy to report that at last this has been done.

The Hartman-Leddon Company, manufacturers of Harleco chemical products, 6010 Haverford Ave., Philadelphia, have just issued a handsome new catalog of 52 pages, *Reagent Specialties for Microscopic Technic,* which includes a very comprehensive listing of dry biological stains, staining solutions, fixing fluids, solvents, clearing, imbedding and mounting media, including such new reagents as are now in demand as dioxan and clarite in small quantities at low prices.

Of especial interest are their kits of dry *Parstains,* trade name for small capsules containing 0.5 gram, which will yield a 1% staining solution when emptied into 50 cc. of the solvent (water or alcohol) and requiring no weighing. There are 11 assorted packages of these, such as Blood Stains, Bacterial Stains, Nuclear Stains, Common General Stains and so on, retailing from $1.25 to no more than $3.00 per set of ten stains. This will certainly be a great help to many.

High school and college teachers will likewise find much to interest them in this publication, which must be seen to be appreciated.

To secure your copy, write to Dr. Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St. N. W., Washington, D. C., ask for the Harleco catalog and enclose three-cent stamp for postage.

Do you need a scientific dictionary? We have located a dandy which we can recommend highly as up to the minute. All scientific fields are fully represented; pure and applied, engineering, technological; there is a bibliography and many tables, such as chemical elements, periodic, igneous rocks, sedimentary rocks, animal kingdom, plant kingdom and the like. Thousands of words not found in ordinary dictionaries are included, and the definitions are compact and precise—more than 50,000 of them. *Chamber's Technical Dictionary* is the title and the price is $5.00. The Macmillan Co., 60 Fifth Ave., New York City.

The most interesting scientific book that has come to our desk in many a moon is the way we would describe *Human Biology,* by Professor George A. Baitsell of Yale University. Using man as the type and approach, a most comprehensive and modern consideration is given of the structure and function of the mammalian organism, together with fundamental biological principles. The volume is distinctly not a human anatomy or physiology, but much more, being everything the title implies, and is written in masterly and interesting style, splendidly illustrated. Pp. xv, 621; plates XVIII, figs. 260; a new departure in a lengthy appendix consisting of a detailed glossary of terms, often in the form of quoted material from outstanding original sources. The price is unusually low for a new book of this size. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. $3.75.

It is always a treat to review a new manual of microtechnique, and we have before us an especially fine book, this time one for the botanists. *Plant Microtechnique* by Donald A. Johansen of Stanford University has come from the press to take its place among essential works in the library of the microscopist. The entire field is covered in a very practical way, the first section consisting of sixteen chapters on general methods and the second of fifteen chapters on special methods for the various plant groups. The illustrations are very good and we are pleased to see the inclusion of set-ups, operations and other how-to-do-it photographs that will prove very helpful for the amateur working without supervised instruction. The newer techniques receive adequate treatment along with the older standard methods; considerable attention is paid to chromosome smears and to microchemical identifications; and there is a very useful chapter on sources of supplies. We recommend this volume highly to investigators, teachers and amateurs who are concerned with any phase of botanical microscopy. Pp. xi, 523; figs. 110. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. $4.50.

Heiss, Obourn and Hoffman, *Modern Methods and Materials for Teaching Science* will appeal to that large number of our readers who are concerned with methodology or the practice of science teaching in the secondary schools. Practical directions and suggestions are given for every phase of work, such as lecture demonstrations, quizzes, field trips, student projects, balanced aquaria, motion pictures, science clubs and a host of others. This book is a mine of tabulated information on methods and especially as to kinds and sources of materials. Pp. x, 351; 27 figs.; charts, tables, lists, bibliographies. The Macmillan Co., 60 Fifth Ave., New York City. $2.50.

"The most valuable thing in the world is life, and the most valuable life is that of man. If we accept these propositions, what is more important in gaining an appreciation of our place in the world than trying to understand what life is? It is this formidable and entrancing problem that is the theme of *Unresting Cells.*" With this opening, Arthur Compton writes a foreword to a book by this title, from the pen of Professor Ralph W. Gerard, of the University of Chicago.

The whole story of cells is here unfolded in most readable and fascinating descriptions, ably assisted by a wealth of splendid new illustrations by Elizabeth Buchsbaum, whose work we noted in an earlier review. No previous scientific training is needed to gain from this book a satisfactory understanding of the findings of modern science as to the origin of life in general and cells in particular; the integration of the whole organism; the chemical activities and physical construction of cells; the capturing and use of energy; the behavior, organization and life cycles of cells; and the operations of hereditary factors.

Recommended for all readers interested in biology, physiology, or the chemistry and physics of living matter; laymen, students, and teachers; an excellent gift volume for that friend who has these interests. Pp. xv, 439; figs. 173. Harper & Brothers, 49 East 33rd St., New York City. $3.75.

A.S.A.M. News

Membership has grown to 750, with new recruits added almost daily. Chapters now total ten, the latest (Kappa) being the Brooklyn Chapter, the formation of which has been supervised by Cornelius Denslow of the Brooklyn Children's Museum. The Chapter has its headquarters at this institution and consists of both adults and high school students. Adequate facilities and instruction are provided; members living in or near Brooklyn should look into this opportunity to further their interests. This Chapter has printed membership cards patterned after those of the national organization.

The only states not as yet represented by membership in the A.S.A.M. are now Mississippi, North Dakota, Montana, Wyoming and Nevada. All of the major U. S. territories and possessions are included, as well as all Canadian provinces from Ontario westward, several Latin American countries, and England. The war put a definite terminus to our rapidly expanding memberships abroad, but we may look forward to their resumption later on, since microscopy is one of the best and most successful of all post-war and depression-period hobbies. At such times, people want a hobby that has a serious and practical or educational slant.